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from
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Spring, 1936

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Comment

THIS issue of the Journal is devoted to the available papers from the convention held under the auspices of the Philadelphia Chapter in April of this year. They represent an informing cross section of the principles and methods in certain operating fields, where the experience of the Philadelphia area is instructive.

This whole contribution to management thinking from one area suggests the unique value of this type of convention not only as showing the vigor and benefits of local leadership but as dramatizing the high spots of management advance in a given locality.

Each region of our country—and this also means virtually each Chapter—has a certain nucleus of regional experience and point of view which are uniquely valuable.

The study of the Washington Chapter of management in the public service, further illustrates the distinctive value which the individual Chapter can attain out of local preoccupations.

It is greatly to be hoped that our several Chapters, both by their regular meetings and, where feasible, by special regional conferences, will capitalize on their distinctive local conditions in order to contribute their special data for application and illumination in other regions.

Thus, all can learn from each!

It is in this sense that the more we cultivate our own (management) gardens locally, the more we will contribute usefully to the whole national movement.

Planning and Production Control in the Factory

By C. F. GUNTHER

Supervisor of Planning and Wage Rate Department, General Electric Co., Philadelphia Works

SUMMARY

A method of keeping control of orders as they pass through the various stages of production is here described in detail. Procedures for obtaining cost records, tool checks, raw material controls and for determining wage rates are outlined.

THIS paper will deal primarily with the planning and preparation work of component parts and their subsequent production and its control in the Switchgear Plant of the General Electric Company, West Philadelphia. In this plant we manufacture apparatus ranging anywhere from one pound each for the small AF-1 Breakers to many tons each for our large O.C.B. and Metal Clad equipment. We handle rough work such as steel structures made from channels and angle iron to the fine instrument work required for relay manufacture. Eighty per cent of our total part orders placed on the factory call for ten pieces or less and repeats to non repeats run about equally. We issue approximately three thousand part orders weekly. The figures just quoted show that our factory can well be classed as a large job shop.

Before the installation of our planning and production system (1929), we found our shops were gradually drifting into a chaotic condition. Foremen were loaded up with clerical detail, time studies were made that had no future value and the production force was increasing by leaps and bounds, chasing materials through the shops, and the paperwork throughout the plant was terrific.

A study of all clerical and wage rate activities was made, resulting in our present production system, which has saved us many dollars and plenty of grief. Today we do the job much faster and with less effort.

Let us start off with the production department issuing the component part orders. Upon receipt of a customer's order, the order clerk takes the corresponding material list from the file, which is prepared in hectograph simultaneously with the tracing and furnished by the engineering department.

This list is checked across the stock card file and symbolized as follows: S denoting stock materials, BOC —bought outside, and M—make in our factory. All make items are then ordered on the dupligraph section by means of an order card. A 5x8 "Kardex" card is only used for stock items and is used for the automatic replenishment of stock materials when the card reaches order point. A 3x5 card is used for the ordering of requisition items. On repeat orders, the writing in of the S.O., due dates and quantity is required only. Orders for new jobs must be accompanied by the drawing for the planning of labor operations.

All wage rate personnel required to set up the addressograph plate is located in the addressograph section, that is, material specialist, operation planners, and estimators.

All incoming orders are clocked in as to time of arrival and divided into new and repeat orders.

New orders are turned over to the material specialist, who determines and records the size and weight per C of the raw material on a work sheet, and turns the job over to the operation planner, who establishes the labor operations in the proper sequence, the method of performing the operations, set-ups and piece prices. He also determines the range of quantity for which operations and prices hold good. The order with work sheet attached is then placed on the graphotype machine where all information appearing on the work sheet is embossed on zinc plates. These plates are then assembled in the frames by a checker who prints the identification for the back of the frame and the operation cards on a cardograph machine, checking for accuracy at the same time. The job papers are then assembled and are sent with the frame and production order to the dupligraph machine, where the variable information is set up on a series of numbering wheels, i.e., shop order, due dates, and quantity and symbol of the production man handling the requisition.

The papers are then printed, clocked out and distributed to the interested parties. All operations in the addressograph section have been time studied and a record is kept of the operating efficiency of this department. The allowances are as follows:

3.5 minutes	for repeat order	
6	for new order	
2.5	for changes	per order
2	for filing and miscellaneous work	

Service is guaranteed for repeat orders— 7 hours
new orders—14 hours
which includes Wage Rate

Actual Total Average— 5 hours

The copies printed carry the job from the ordering of raw material to the cost department eliminating all handwriting along the line.

Changes can readily be made by blanking out and re-embossing characters on the zinc plates, and are taken care of immediately to keep our plates up to date and ready for the next order.

The distributed copies are roughly divided into: 1. Production copies to production department; 2. Material book to raw stores; 3. Control board copies to control board.

The production copies consist of the blue print copy, the production copy, the dispatch copy, time vouchers, and the job and cost record card.

The pink production copy is filed by drawing number separated by requisitions. All other copies are filed by raw material due dates in the dead load file and are released to the control board upon the arrival of the material delivery copy in the production department.

Since all progress of our jobs in process is reported by means of these copies, we have adopted a color scheme, which enables us to get certain refinements that could not be obtained with paper of one color. The requisition file is an example of the advantage of the color scheme.

This file will be pink when the orders have been placed. It gradually turns orange as material is being delivered to the shop, green as the shop completes the jobs, and yellow when the material is received in the stock room.

The production man knows by scrutinizing his file where pressure may be necessary.

The material book is sent directly to the raw stores card file; the copies being in the proper order as they are used.

Upon arrival, the file copy is removed from the book and filed by date as an acknowledgment of the order. If the material has to be bought outside the R.M. notice is removed and sent to the requisition file carrying the order number and promise of delivery. If the material is available, the R.M. available copy is sent to the requisition file. The material book is then sent to the raw stock floor, where the order is filled. The R.M. delivery copy is removed from the book and sent to the requisition file for the release of the job papers to the control cage, and the material book is attached to the material and delivered to the incoming station of the first manufacturing department.

The control cage is now in possession of the job papers and the material. The control cage in the meantime has also received the green index copy and the manilla tool check and move card.

The index copy is immediately placed in the index file by drawing number. All movements of the material are recorded on this copy as they occur during the process of manufacture and it remains in this file until the job is completed.

The tool check is sent to the tool crib, adjacent to the control cage, for the accumulation of tools. When this is completed the copy is marked and returned to the cage and temporarily filed with the index copy. The tool check, from there on, serves as a move ticket.

When the material arrives in the incoming bay, the material arrival copy is detached from the book and all job papers are now brought together, excepting the job and cost record card, which is placed in the time keeper's file by drawing number for the posting of finished labor operations and is then sent to the cost department where it is used as a detailed cost record.

To exercise efficient production control, the shop must be laid out into work stations. Each station must be numbered, beginning with an incoming material station and concluding with an outgoing station. The inspection station is also numbered and should be adjacent to the outgoing material station. A condensed re-production of this layout must be provided in the control cage, which is the control board, and the control cage must have absolute control of all inter-departmental transportation. The floor layout should be studied and work stations placed in such a way so as to prevent back track of material as much as possible. We have adopted a standard-sized control board of fifty-six pockets, which can be used in multiples if desired. Two pockets are generally used for each work station; the upper pocket carrying a red name-plate denoting all work which must be completed during the current week; the lower pocket carrying a blue name-plate, which is for other production ahead for this station. The red pocket is sub-divided into three sections, denoting job in process, next job to be run and

other work ahead for the current week, lined up in due-date order.

All jobs are taken care of according to their importance as follows: 1. Complaints, 2. Supplies, 3. Assembly holdups, 4. Defective work, 5. Shortages, 6. All other orders (according to due dates).

Other routines that are too numerous to mention have been set up to keep the control board operator thoroughly informed, regarding his machine equipment, operators, and the work itself.

When all job papers are received in the cage, the dispatcher assigns each operation to a specific work station. These station numbers are then recorded on the dispatch copy heading this list of numbers with the stations for incoming material, and concluding with the outgoing station number, and encircling the resting place of the material, which is of course the incoming station. The move card is then marked with the incoming station number, encircled of course, and with the station number of the first operation. A number encircled meaning "move from" not encircled "move to."

The material trucker takes this card, moves the material, encircles the new station number and returns the move ticket to the cage where it is passed across the index file for the recording of the change. The order is now placed in the proper pocket in the control board where it moves from the blue pocket to the lower section of the red, into the next job section and finally reaches the in-process section.

All work is assigned by the control board operator by handing out a time voucher for a specific operation and the drawing. When the operation is completed the voucher is returned to the control cage, properly stamped with name and pay number of the operator, for which addressograph machines have been supplied in the shop. The move ticket of the job is then marked with the station number of the second operation. The material is moved, the move recorded on the index copy, and the order placed in the pocket for the second operation. This cycle is repeated until all labor operations are completed and the job rests in the inspection station. After inspection, the inspector's copy is detached from the material book, punched by the inspector and delivered to the control cage, to release the order from the control board.

The dispatch copy is then stamped "completed" and kept in the control cage as a record of completion. This index copy is also stamped "completed" and sent to the requisition file in the production department.

This system resulted in:

Freeing our foremen of clerical details, to do a better mechanical and administrative job.

Almost entirely eliminating material chasing.

Providing us with wage rate records that I class with the best in the country, and which are absolutely necessary for organized manufacture.

Reducing our manufacture cycle to approximately one third of the time required previously.

Now, I would like to touch a little on our wage rate activities.

Every manufacturing plant should have a complete list of occupations evaluated by rates of pay, relative to one another, which form the basis for the setting of rates.

Rates of pay, prevailing in the district and also competitors' rates, should be gathered periodically, for comparison purposes and must be closely watched. We compile average earnings quarterly for comparison of our actually earned rates with our anticipated rates.

In a plant like ours, where small orders prevail, very few time studies on individual jobs are made, and most prices are estimated, it is of paramount importance that rate men have their thumb on the trend of earnings all the time, to permit them to tighten up or loosen up in occupations as required, to keep earnings somewhere near the anticipated rate for the average man.

Our wage rate department is responsible for the specification and figuring of all raw materials used on production orders, the planning of labor operations, the setting of all rates and of all estimating for the cost department.

Material specification is an important factor in the control of inventory and cost, and particular care is exercised in calling for the most economical size of material, taking into consideration standard sizes carried in the plant, tool equipment and machine tools.

Labor operations are planned to the finest detail, giving description of the operations in proper sequence, tools and machines to be used, set-ups and prices to be paid. A recent survey indicated that 51 per cent of our prices are established by formula, 6.5 per cent by time study and 36.5 per cent by comparison and estimate.

Cost estimates are recorded on a work sheet in duplicate, one copy retained by the cost department, the second copy remaining with the rate man to be used as a guide when production on the part is authorized.

It can readily be seen that a wage rate force called upon to perform all these functions and execute this work speedily and accurately, must consist of first-class men that know their business and must be supported by

adequate data such as factory layouts, capacity of equipment, piece rate tables, comparison books and by sound fundamental wage rate policies.

We have in the last few years gathered fundamental data in our own shops and from other sources and established piece rate tables that are indispensable at the present time. This work is going forward all the time as conditions and methods change to reduce cost and increase the efficiency of the plant.

Another branch of industrial engineering has been recognized during the last few years to be of utmost importance, namely, "job evaluation." Job evaluation is the name given to a procedure designed to establish wage rates that qualified operators are expected to earn, on any class of work, conditions being normal, and its application should result in consistent rates based on the requirements of each job.

The value of such an approach to the establishment of hourly rates is twofold. In the first place, it is an aid in justifying wage differentials within an industry and leaves a positive record of the reasons for the differential. This creates greater equity in the rates paid different jobs.

In the second place, it lays the foundation for a simpler and more accurate and complete method of wage comparisons among district industries than has ever been possible before.

Briefly, this can be accomplished by merely drawing their respective wage curves against the scale of point weighting used. Two curves, one for day work and the other for incentive rates earned per hour, would show what earnings would be made in any industry for any job, regardless of whether they actually have the identical job or not.

The plan is briefly as follows:

A study of average rates paid in industry for a variety of tasks and a careful analysis of the detailed considerations involved leads to the conclusion that all factors which can logically be considered as affecting job values are embodied in the following factors:

Skill	Mentality Training Period
Responsibility Application Working Conditions	Mental Physical

Jobs are arranged under each factor in their relative importance, as indicated by point values assigned under this system. As this list of jobs expands, additional jobs can be evaluated more accurately by fitting them into their proper places on this key list.

The total point value of a given job is found by adding together the point values under the four factors, plus the number of base points, which is a constant, denoting the point value of *that* job, evaluated at zero points for all factors.

The system is illustrated by the following tabulation of five representative jobs.

DEFINITIONS

Tool Maker—4511

Working from drawings, making jigs, with complex adjustments, complicated holding fixtures, etc.

Milling Machine Work—2503

Mill to close dimension in fixtures, milling splines, must maintain alignment and accurate centers. Slight error will cause loss of piece.

Lathe—2303

Up to 36"—turn, bore and thread to close tolerances, turning and fitting tapers, intricate and non-repetitive, develop job complete with gauges, responsible for expensive material where slight mistake in reading scale or micrometer would scrap entire piece.

Sensitive Drill Press—2722

Drill in jigs to close dimensions—some chance of error on depths of holes, etc.

Sweeper—1303

Sweep shop areas (remove chips and refuse), lowest type of common labor requiring no training. Does not handle or move material.

Occupation	*Code*	*Skill*	*Resp.*	*Appl.*	*W.C.*	*Base*	*Total Points*
Tool Maker	4511	345	45	45	0	400	835
Lathe	2303	310	30	40	5	400	785
Milling Machine Work.	2503	195	30	35	5	400	665
Sensitive Drill Press ..	2722	100	5	30	0	400	535
Sweeper	1303	0	0	40	0	400	440

These point values should be reasonably permanent. The value per point will, of course, vary, in accordance with different company policies and with general wage levels. This system is endorsed by eight of the largest firms in this area, and every industrial engineer should lend his support to achieve the general adoption in industry of a common plan of job evaluation, in principle at least, which will result in adequate and consistent compensation for labor in accordance with mentality, skill, responsibility, application and working conditions involved.

Cost Control In the Office

By ROY G. RANK
Manager, Business Clerical Division, Curtis Publishing Co., Philadelphia

SUMMARY

Standardization of clerical operations is essential to real control of costs. Clerks can then be placed in salary classes, each with a specified maximum. Group organization has proved valuable and supervisors occupy an important position in controlling the costs of the individual groups.

IN PRESENTING some material for your thought on the subject of cost control in the office, I propose to discuss some of the actual procedure in the offices of the Curtis Publishing Company because I believe that management, in this day, requires practical thinking and the application of practical methods to the solution of its problems.

Through some years of experience we have learned that almost the first phase of this subject that must be given consideration, is the unit of measurement.

In one of the larger clerical divisions employing up to four hundred fifty clerks there are in use every day, more than four hundred different clerical operations, yet it has been found possible to use as the basic unit of measurement in considering costs for a large number of these operations, a subscriber to one of our publications. Some modifications are necessary of course, particularly in the operations concerning the reading and recording of subscription orders sent to us by approximately fifty thousand agents throughout the world. For these operations, the order is the basic unit of measurement.

The division in question maintains a file containing over four million names to each of which must be mailed copies of our publications as they are issued. Some of the operations involved are the embossing of small metal plates from which address labels are printed, collating these plates by state, town and name, filing them, printing the labels, changing subscribers' addresses, and a host of others on which the obvious unit is one subscriber. In many of our production records, however, we do record number of plates filed, number of labels printed, etc., as a matter of convenience and simplicity for the management's use in discussing production with the rank and file.

In another comparatively large division there are more than two hundred clerks engaged on approximately four hundred different operations that are used principally on an Accounts Receivable numbering about three thousand five hundred accounts. For the major portion of these operations the unit of measurement is the account. Here also, we are required to make some modifications to take care of operations involving smaller units. This division is responsible for the consigning of copies of our publications to the distributing agencies and news dealers throughout the world, the billing and collecting of the charges for these copies, the recording and allowance of credit for unsold copies, and an elaborate statistical analysis of sales and branch-office costs.

At the other extreme as far as the number of clerks and operations involved are concerned, we have the Payroll Section employing twenty-five clerks whose work is divided into thirty different operations. These include not only the calculation of earnings, but also the distribution of certain wage costs, for which the units of measurement are clock registration cards, pay envelopes and job tickets. In the handling of mail, both incoming and outgoing, we use envelopes as the unit in the groups that open the incoming mail and enclose, seal and mail the outgoing. The correspondents who dictate mail, record number of letters and the transcribers and form typists use the reading of a meter that records typewriter key strokes.

I believe the manner in which our cost is controlled in the first mentioned division will be of most interest because of the rather formidable number of operations and clerks involved, and I shall therefore give you a brief outline of the procedure in that division.

You must, of course, appreciate that the standardization of clerical operations is absolutely essential to the real control of costs, and in this particular division, two hundred sixty five of the four hundred operations are standardized.

The numerous clerks are placed in definite salary classes, each with a specified maximum salary, and the standards applicable to the operations generally performed by the clerks in each class are established within

the same limits, with the highest theoretical possible requirement for the maximum salary, and scaled down from that.

Most of the clerks are trained on a number of operations and in any payroll period they may work on several. For the purpose of determining a clerk's efficiency on all standardized operations combined, as well as for the simplification of the calculation of bonus earnings, an arbitrary point valuation has been established, which enables us to convert all standardized production to a common denominator.

The clerks record on an operation card the time started and finished, and unit production for each time they work on a job or operation using the one card for the same operation or job for one week. Spaces are provided for as many as eight entries per day, although the occasions are rare when a clerk will start and stop on the same operation more than three or four times daily. The clerks handling the large volume of detail in this division are divided into six groups, each group performing the same operations, and each being responsible for the maintenance of approximately one sixth of the four million subscriptions. Each of these groups is supervised by a woman who has been promoted from the ranks after some years of training and experience on the many operations in the group.

I wish to place particular emphasis on this type of group organization where all operations are performed in each group, as distinguished from the grouping of certain functions. We have used both methods but actual experience has proven beyond peradventure that the former is far superior to the latter when the volume is large enough to provide work in lots that are not too small. The work is done on a functionalized basis within each group, however, there being sufficient volume to enable us to assign several specialists to each of a number of groupings of related operations. Further reference will be made to this later.

At the close of each day each clerk places all of her operation cards in an indexed receptacle on the Supervisor's desk, and the Supervisor examines them for possible inaccuracies as to operation number, hours worked and production, for as it will be pointed out later, the Supervisor has a very vital personal interest in the accuracy of these records. By no later than 9:30 A. M. on the day following the close of the payroll week, the operation cards for the week are collected from the Supervisors and delivered to the Payroll Section along with the corresponding clock registration cards.

There the registrations are examined and wages calculated for the hours of work indicated on the clock cards. Elapsed time is computed from the entries on each operation card, a total of hours arrived at for each operation for the week, a grand total of all operations, and this checked with the hours on the clock card. The total elapsed time on each operation card is converted to cost through the use of the wage rate for the individual concerned, this cost is entered on each card and the sum of all checked with the wages calculated from the clock cards.

The operation cards for the non-standard operations are placed aside and on those for the standardized operations, the unit production is totaled for each operation and converted to points through the medium of a point allowance, the points and hours totaled for the week and bonus earnings calculated. Weekly bulletins listing the clerks according to their hourly averages for the week and indicating the standard requirement for their individual salary, the group in which they worked, the gross bonus earned, the number of errors made, the amount of bonus lost through penalty for these errors, and the net bonus that will be in each pay envelope, are posted in the department on pay day.

These bulletins are received and scrutinized by all concerned, with a great deal of interest and enthusiasm, and therein lies the secret of the control of costs. The tremendous psychological value of this interest and enthusiasm must be quite obvious for it is a powerful force when properly nurtured and directed.

Having established the proper unit of measurement, a standard with bonus payment for excess production, and the proper presentation and explanation of the standard to the rank and file, the matter of cost control is reduced to a comparatively simple task.

To a very large and important extent, the success of this method is dependent upon the adoption of a standard that is fair to all concerned, one that the workers realize is possible of attainment and one that contains enough of a challenge to arouse their enthusiasm and competitive spirit.

To establish a standard we approach the situation by first making a careful and thorough analysis of the job, determining after much deliberation and study of this analysis, the one best method to be used to do the job most efficiently and the unit of measurement to be used. After this has been done, the clerks are thoroughly instructed as to the proper procedure and thereafter their time and unit production is recorded on operation cards. When they have had ample time in which to so

firmly fix the procedure in their minds that it has become somewhat automatic, a time study is made. This study is discussed by the manager of the division in which the work is being done, the specialist who made the study, and the manager of the Standardization Division, and a standard arrived at that is fair and reasonable, and agreed to by these three individuals.

In conclusion I want to explain to you the Group Supervisor's position, which I believe, will prove to your satisfaction the merit in the existing type of group organization and its contribution to the control of costs. Comparative cost reports are supplied to all Supervisors monthly, on which are shown for each group, the total cost, unit production, cost per thousand, and a saving or loss compared to the average cost per thousand for all groups combined, for the same month of the previous year. The groups are listed according to the total saving or loss, and while these costs are determined from the operation cards, they are shown on these reports in certain logical operation groupings so that each Supervisor may compare her own results with the best in each grouping. If further details are necessary, they can be readily supplied by operation, for each group. This report is received by the Supervisors with the same interest and enthusiasm as that with which the clerks receive the weekly bulletins, because their competitive spirit has also been aroused and carefully nurtured.

The Supervisors occupy a most important place in this entire scheme, not only from the standpoint of cost control but production control as well. The daily work in these six groups must be completed at approximately the same time and if a group lags behind the others it must accept and pay for help from a better situated group, and there always exists the feeling that clerks from another group may not be able to do the work so economically. The result is that each Supervisor will carefully watch the flow of work and so assign the personell in her group as to obtain the maximum of output and efficiency, not only to avoid accepting help from another group, but to be in a position to give help for which her costs will receive credit.

The Supervisor is vitally interested in the accuracy of the operation cards of her clerks for the simple reason that every dollar of wage and bonus paid is ultimately charged to her in the monthly cost and unless the time and production is correct it may affect her costs adversely.

To summarize then, we should seek the one best method, determine a unit of measurement, arrive at a standard that is fair and reasonable, "sell" that standard to the workers, and organize the personnel on a competitive basis.

All of which, I sincerely hope, may contain something of practical value to you in the consideration of cost control in *your* office.

The S. A. M. Badge—

is made of 10-carat gold and weighs 1½ dwt. It can be made as a pin with safety catch or as a button with screw back. The badge is a duplicate of the emblem of the Society* reduced to five-eighths of an inch in diameter. The design is in clear relief and the lettering is highly polished. The price of one pin or button is $3.50. (A pin or button, suitable for student members, in electro plate, may be secured for $.50.)

* See front cover for a print of the emblem.

The Certificate—

is engraved on fine ledger paper, size 6 x 9 inches, suitable for framing. The name, grade of membership, and date of election are written in, and the certificate is signed by the president and secretary. The price of the certificate is one dollar.

Members wishing to order badges and certificates may do so by addressing a letter, together with check, to the national office. If enough orders are not received to warrant the making of dies and plates necessary for the badges and certificates, money received will be refunded.

Initiation Fees and Dues Must Be Paid by a New Member Before a Badge and Certificate Can Be Secured

Functions of Management in Retail Store Operation

By ROY E. CLARK
Publicity Director and Sales Manager, Strawbridge & Clothier, Philadelphia

SUMMARY

The four major functional divisions of the typical American department store are here discussed with the special responsibilities of each enumerated.

INDUSTRIAL engineers, I take it, are fact-finders —research-minded men who are constantly striving to improve methods so that more efficient results may ensue and to find out how the daily routine in many different kinds of businesses may be changed so that greater production is made possible. It is likely that in your jobs you come into closer contacts with the operating and accounting divisions of business than you do with the merchandising and advertising pyramids.

Most publicity men are held in rather low repute by efficiency experts because, although countless attempts have been made, nobody has been able to reduce advertising to an exact science and in many organizations there is a feeling that advertising is wastefully done; that if the proper slide rule were placed on the publicity appropriation, a great deal of money could be saved; so I say that I appear here this evening with considerable trepidation, and can assure you that I will stay out of the realm of theory and confine myself to facts as much as it is possible to do so in a discussion of this kind.

With your permission, I am going to confine my statistical references almost entirely to the five large Philadelphia stores. My experience in the National Retail Dry Goods Association and the Retail Research Association shows that the same general conditions prevail in all sections of the country, so that any statements regarding the Philadelphia stores will be comparable to your particular city, and allowing for differences of size and other general factors, the informative phases would fit into any other of the country's large retail centers.

The annual sales of the five large Philadelphia stores exceed one hundred million dollars. Over sixteen thousand people work in the stores the year 'round and earn somewhere around $20,000,000 annually. Merchandising activities of these stores range from pins to pianos, from luncheons to lingerie, from paints to pants—and in the gathering together of these goods and in selling them, with the multitudinous service factors involved, a large personnel of trained people is required, as is also an accepted division of authority which will insure smooth daily operating.

Each store, like every other business, varies somewhat in its functional set-up, but in a general way, today the department stores of America follow quite largely the so-called Mazur Plan and divide their activities into four major groups—Buying, Selling, Service and Accounting. The men at the head of these pyramids constitute the active operating force of the store and, subject to the control of the General Manager and Board of Directors, are responsible for the way the wheels go around. Titles vary in some instances, but generally speaking, they are called the General Merchandise Manager, the Store Superintendent, the Controller and the Publicity Director.

The General Merchandise Manager is in charge of all buying. Under him come several Divisional Merchandise Managers and under the Divisional Manager, the Buyers—those men and women who are technical experts in their line and actually make the purchases in the markets. Most large stores will have an average of about seventy-five buyers. These are responsible positions and well paid. A buyer must have not only shrewd judgment, but also the ability to sell the goods which he selects, because on the buying staff is very largely predicated the store's success. Take Women's and Misses' Dresses, for example. Do you think that one person could possibly buy all the dresses that a large store will sell? In our own case, we have eight people who do nothing but buy Women's and Misses' Dresses. Each one specializes on some particular type or price line. Each one contacts different market resources and must have a different viewpoint and experience, even though they are all buying what to you might seem very much the same line.

The General Merchandise Manager must keep a close supervision on a tremendously varied and constantly changing stock—an investment which runs into millions

of dollars. The margin of net profit is so small that only the most skilled judgment, with constant supervision, can insure successful operating.

Under the Merchandise Manager comes the Comparison Office—a corps of people who are daily visiting other stores to check up on prices, assortments, display arrangements, number of customers and the like.

Today, about 97 per cent of the merchandise sold in department stores is made in the United States. Money exchange, tariffs, economic conditions, have cut down imports so tremendously that at the present time they constitute only about 3 per cent of the average department store stocks. Nevertheless, there are some things which still must come from abroad and our own store maintains buying affiliations in London, Paris, Florence, Brussels, Vienna, Berlin, Shanghai and Yokohama. In this connection, it might be of interest to you to know that other parts of the world may have larger volume individual stores than any to be found in the United States. It is quite likely that Paris has the largest single store volume in the world, although I am told that Tokio might challenge the statement. Canada has one or two establishments, too, of tremendous volume. Paris has several successfully operated retail concerns, the sales volume of which is surpassed by very few American stores. I am referring to individual stores—not to chains.

The British and Continental stores do many things better than we—particularly in more economical operation and better salesmanship. One reason for this lowered operating ratio is that the stores there do not give so widely extended service as we do, and they pay much lower wages. Most of their business is for cash and they have a big turnover of foodstuffs, wines and liquors. This business in many countries is concentrated in the larger stores because of legal restraints against chain organizations. Those of you who have purchased abroad must have been impressed by the very superior salesmanship you found there. Retail selling is much more of a profession than it is here and if any of you have ever shopped at Liberty's in London, for example, I do not question but what you came out with more purchases than you intended to make, because you were subjected, without knowing it, to a superior, subtle salesmanship which made you buy more willingly.

The charge has often been made that the large store's merchandise personnel set-up is top-heavy and expensive, and the question raised as to whether Divisional Merchandise Managers are really necessary. There are advocates on both sides of the question and this is not the time or place to submit all the pros and cons. The fact is, however, that the store doing ten million dollars or upward annually—and in many instances less than this amount—finds it desirable to have a closer supervision of the many varied lines it carries than would be possible under the supervision of a single General Merchandise Manager, no matter how capable he was. It is in the Merchandise Office that a store must make its profits—the other three major functions are all expense divisions and the utmost efficiency in operating, accounting and advertising cannot show up right on the Profit and Loss Statement unless the merchandisers have the skill to buy goods at the right time, at the right price and in the right quantities. There is no substitute for a good buyer and topping all of these buyers must be a General Merchandise Manager whose skill and experience can direct and guide them along the right lines.

After the goods are on the shelves, the next step is to let the public know about them and so it seems logical to take up the functional details of the Publicity Director, or Sales Manager, as he is called in some establishments.

A great many people have hallucinations as to just what advertising can and actually does accomplish. In the average large store probably not over 12 per cent of the business yesterday, today or tomorrow comes from the merchandise which is specifically advertised. Why then, you may ask, do we continue to spend so much money in publicity? The answer is that we know it is the cumulative effect—constantly keeping our name before the public—that makes advertising necessary. Competition is keen; no store has a monopoly on prestige or value-giving. There have been experiences innumerable where retail organizations have thought that they had reached the point where the public would come to them whether they advertised or not—but the inevitable result has been that unless the store constantly kept itself before the shopping public it soon passed into history. It is frequently said in rebuttal of this argument that many of the great chain organizations do not find it necessary to spend money in newspaper advertising, but it must be remembered that their problem is different from the department stores' and while there are many successful chains which do not have to have an advertising appropriation, I know of no large store, anywhere, which has not found it necessary to publicize constantly its wares and services.

Naturally, every store strives to make its advertising as productive as possible. Newspaper space is expen-

sive. The Philadelphia *Bulletin,* for instance, costs $1,128.00 for one page, one time. The Sunday *Inquirer* costs $860.00 a page and the other mediums are in proportion to their circulation.

Research shows that the usual time given to the reading of a metropolitan newspaper is fourteen minutes. When you take this into consideration, you can realize the terrific handicap which the advertising writer has in his effort to claim your attention. He must compete with scandals, sports news, market reports; floods, Haile Selassie, Hitler, Mussolini and the many other news breaks that go into a daily paper's make-up.

Women read advertising much more assiduously than men and for this reason most of this publicity is directed toward feminine consumption. In the average household mama buys most of papa's things—about 85 per cent of men's shirts, for example, are bought by women. It takes a large staff of writers, artists, proof readers and clerical help to turn out the tremendous lineage which retail stores use every day. There is no time to polish literary efforts or to improve general presentation. Every morning we must start a new day and at closing time that day's work must be complete. The presses start whirring to meet their various editions exactly on the minute and we are always working against a deadline. Included in the same classification as newspapers are mail matter and hand-distributed circulars. Each of these mediums has a rightful place in the promotional schedule. It is obvious that when the appeal is selective, a mail piece is usually much more effective than a newspaper ad. In considering any promotional item, we always try to take into consideration its possibility of sale. Women's stockings, for example, have an almost 100 per cent possibility of sale. Every woman, young or old, rich or poor, black or white, must have stockings every day and if the merchandising and advertising proposition is right, profitable results from presenting it to the greatest number of people may rightfully be expected. In babies' goods, the possibility of sale is not nearly so high as in women's stockings. We might offer the grandest bargain in diapers that the world has ever seen, but there are not babies in every home and therefore the sales results would be in proportion to the possibilities. In men's made-to-measure clothing, for instance, newspaper advertising would be very expensive because not many men have their clothes specially tailored and it is obvious that a mailing list of a few thousand men who would buy custom-made clothing would bring far greater results in proportion to expenditure than the same appeal made in a newspaper where only a few readers out of every hundred would be interested.

In many cities, *Shopping News* has been an effective publicity medium. We had a *Shopping News* in Philadelphia some time ago, but it was not successful. Philadelphia does use, however, many large-edition, hand-distributed circulars and issuing one of these circulars is a prodigious task for the advertising staff. The preparation of copy and art work must be done in advance and at the same time the daily schedule must be maintained. The total edition of a circular of 350,000 of from sixteen to twenty-four newspaper-sized pages, runs into tremendous bulk and may require over fifty tons of paper. It takes three hundred men and many trucks and wagons to distribute such a circular in a single day. This distribution is done by companies who specialize in this kind of work.

Next to newspaper advertising on a promotional schedule, are displays: window and interior. The right kind of displays are very important in attracting attention and selling stocks. It takes a large staff of skilled artists and decorators to have consistently attractive windows and interiors. European stores depend far more on selling by display than they do by the printed word, and certainly our own Five-and-Ten-Cent chains do a wonderful job in this respect. If you have not already seen it, I would certainly recommend that every one of you who are interested in scientific lighting, skillful layout and practical selling presentation of merchandise, see the new Kress store on Fifth Avenue, New York. All stores are constantly studying how to make their displays better to attract public attention, with the resultant tinkle of the cash register.

In connection with displays are signs and the sign family is a big one. As you go through the stores you have noticed signs everywhere, telling the prices and descriptions of the merchandise, but did you ever stop to think that every one of these must be individually made? Various sign-writing machines are constantly being introduced and in recent years have been made much more efficient and practical, but in most concerns a corps of skilled men is kept busy all the time, making the hundreds of thousands of signs needed.

Use of the radio as a retail store publicity medium is still in its infancy, but it is a promotional factor that cannot be ignored and will grow constantly more important.

The Publicity Director is in general charge of all these various kinds of promotion. He must keep track of each department to see that it is getting the proper

amount of advertising and that expense is in line with sales. He must make the plans for large special events. He must arrange for style shows and other general attractions. He must contact daily his assistants in the advertising, the display and the radio. But most important of all, he must watch public reaction and make sure that the store's policies are lived up to. With one eye he must see his store from the inside and with the other he must see the store as the public sees it.

Following the sequence of reviewing, first the General Merchandise Manager who must buy the goods, and the Publicity Director who must tell the public about them, the next functional group would be the Superintendent's Division, which is responsible for the selling of the goods, with all the many service phases involved.

In this important classification we are coming into the territory with which most industrial engineers who have retail connections are familiar. The countless phases of store service make it always possible to find ways and means of doing better some particular job. Unlike advertising, a great deal of store operating can be definitely measured. There is one best way to wrap a package; there is one most efficient way to mark goods; there are certain provable forms of workroom methods; there are demonstrable standards in the delivery department which can be proven right or wrong, so that in this functional group of the department store set-up, the industrial engineer has probably his greatest opportunity.

The general public, in thinking of department store employes, is most likely to think first of the salesperson and is usually surprised when told that it takes nearly two non-selling people to back up the services of every salesperson. An average of about one-third of every department store's personnel is male and two-thirds female. It would take too long to attempt to describe in detail all the responsibilities which head up to the Store Superintendent, but mention should be made of some of the most important.

First would come the department of personnel and training, because every employe, with the exception of department heads and major executives must clear through the Personnel Office and nothing is more important in any business than efficient supervision of personnel. Every employe is a human being, with different abilities, different qualifications, different home environment and educational background. To get the utmost efficiency out of these thousands of people is a very great problem; to see that the right wage standards are maintained, that working hours and departmental conditions are adjusted on the basis that is fairest for both employer and employe—all of these things must pass through the Superintendent's Office, via his Department of Personnel and Training.

Keeping the store clean; keeping watch over the large staff of mechanics which is necessary—carpenters, electricians, painters, plumbers, elevator mechanics, etc., is an important sub-division. The Superintendent's Office is responsible for the Traffic Department, which must keep in constant touch with all merchandise shipments and see that they are handled to the best advantage. The Purchasing Agent comes under the Superintendent and buys all of the countless items of supplies which go into the large store's daily routine. The thousands of orders which come in daily by mail and telephone are under this functional classification, as is also the highly important phase of customer adjustments. Theft, by either employe or outsider, and many other forms of criminal malfeasance have to be guarded against every day by the Superintendent's Office.

The receiving and marking of millions of dollars worth of goods is a big task and one of those in which improved methods are constantly being introduced. And after these goods have been marked and sold they must be inspected, wrapped and delivered—another part of operating in which the keenest supervision is necessary.

Statistics show that there are fourteen distinct operations and ten human contacts from the time an item is purchased from the salesperson until it is finally delivered to the customer. Each one of these fourteen operations leaves a possibility of error and the use of right or wrong methods.

The Delivery Department is a business in itself. For instance, in the past ten years this one store's delivery fleet travelled more than twelve million miles. In this period, 1,667,132 gallons of gasoline have been used.

The safety factor for drivers is an important one and a system of awards to drivers for reduction of accidents has resulted in savings on insurance rates and an increase in courtesy and service to customers. Thus, it can be seen that a constant supervision of men and machines is necessary in the Delivery Department of a store and yet this is only one phase of the Store Superintendent's duties.

Recently I heard of some ways of improving employe efficiency, which may or may not be new to you. One had to do with the use of the right shoes by girls and women whose duties require them to be on their

feet most of the day. It was found that certain types of shoes furnish the necessary support to the arch and in wearing these shoes, fatigue was lessened and the girls came to the close of the day in much better physical condition and with consequent higher efficiency standards than when they wore other types of shoes which left them tired.

The Controller is responsible for all accounting and credit matters. He keeps the financial management of the firm informed as to the money arrangements which must be made. He must look out for the billing and bookkeeping and see that credit and collections are where they should be. He is in charge of all insurance and tax arrangements. He keeps a supervisory eye on expenditures in all the other divisions—all operating budgets must pass through his hands and he must be conversant in a general way with every one of the merchandise and service departments.

It is a far cry from the high-desk, eye-shaded, black-sleeved, ledger-surrounded bookkeeper, with his laborious hand entries, to modern accounting methods, and industrial engineers have had much to do with the perfecting and improving of these systems, such as we know them now. Some of you here can remember how retail accounts were posted in a ledger from day to day and at the end of the month, hand written on individual bills. Then came the development of the typewriter and the manifold billing. Today records can be kept by the photographic process and made at the rate of one hundred fifty a minute.

This is only one example of improved efficiency in the accounting department. Much the same thing has come forward in handling charges and C.O.D.'s. The Mail Department in most stores is under the Controller's Office and today thousands of letters an hour can slip through machines which seal and meter them for postage, instead of working with a sponge and a sheet of stamps. Industrial engineers have had much to do with credit authorization methods, setting up task-and-bonus standards which speed up the entire force and make possible better rates of pay.

Much has been accomplished, too, in the Accounting Division in the way of improved floor layouts, studying the effects of proper ventilation, designs of desks and chairs, and so on. The Controller's Office is one in which proper method must be constantly studied—to furnish those essential figures to department heads that will guide them from day to day and yet not supply so many that an executive's time is entirely taken up with pouring over columns of red and black ink.

Most retail businesses run very strictly on a budgetary basis and the Controller must supervise and keep informed as to all merchandise, advertising and service expenses.

Under him comes the Credit Manager, and with one or two outstanding exceptions, retail business today is conducted on a charge basis rather than on cash. It is no unusual thing to have 100,000 or 150,000 customers on a monthly charge account basis and of course the tremendous increase in installment selling has brought about new problems to meet in methods of handling extended payment business. Following the charges, inevitably come the collections and this again is a section of retailing for which the keenest analysis is necessary. Think too, of all the hundreds of bank checks which must be written daily in payment for goods and services, of the invoices that must be checked, of the cash that must be accounted for—all of these come under the Controller. So does insurance. The average large store will have something like forty different classifications of insurance and almost as many more of taxes.

The Controller must be an insurance expert, tax expert, a skilled accountant, a specialized job analyst. He probably knows more about the intimate details of the business as a whole than any other of the pyramid heads and while we have described his duties last in this presentation, he is far from being least in the big-store set-up.

I think department store employes of all classes are as well paid and as well taken care of as in any other similar commercial occupation. The store with which I am connected is probably no different in this regard than any long-established, soundly functioning large retail concern and in our employ we have several hundred workers who have been constantly with us for more than twenty-five years; some have been with us for over fifty years and are still active; we have a Pension Fund; we have an account where employes may safely put their savings; we have a Relief Association which pays benefits when they are ill and death benefits when they die. Everyone who has been with us two years gets two weeks vacation with pay. We conduct an employes' restaurant where good lunches are obtainable at small cost. Depression times, NRA and other general economic conditions have made some changes up and down the wage scale and working hours, but most stores have a very considerate attitude towards employes who give faithful, attentive service.

As business recovers, the industrial engineer will

(Continued on page 140)

Motion Study Section

MOTION STUDY AS A BASIS OF EMPLOYE TRAINING

By LILLIAN M. GILBRETH
Gilbreth, Inc., Montclair, N. J.

Motion Study is proving itself useful to three groups:

1. Specialists, who are interested in research and application of its results in the field of developing more clearly stated principles and techniques of measurement of expenditures of time and energy at work.

2. Engineers and others in industry who use motion study, or work with those who do, and who want to know its theory, but especially its practice.

3. Everyone who is interested in becoming motion minded, in order to use his time and energy more profitably, or to help others to use theirs.

It is obvious that group one is a part of group two and group three, and group two, a part of group three, therefore establishing motion mindedness is the most far-reaching job, and the first to demand consideration.

"Training" is gradually being accepted as a continuous process, necessary for everyone. This thought was reflected in the papers at the London Congress on Management last summer, where training was discussed as it is being given to every type of member of an industrial organization, from apprentice to top executive. In one sense, each such member may be considered as an "employe," and motion study presented as a basis on which training may be established.

The man or woman who enters industry today has had more opportunities to think in terms of expenditures of time and energy than has the entrant of any previous age. Power and machines, with their possibilities of saving time and energy; the radio, with its emphasis both on "time when" and "time how long"; the telegraph and telephone, which emphasize both distance and time; more frequent technical and popular discussion of both physical and emotional fatigue and their causes and elimination,—these should provide a group adequately prepared for motion-study training.

While as yet there has been no wide-spread or coordinated attempt to teach motion mindedness in the grade schools, the high schools or the vocational schools,—such work is being done in some of the colleges, and is increasing yearly. Engineering schools like Iowa State, Massachusetts Institute of Technology, New York University and Purdue are presenting intensive courses, in their mechanical engineering or industrial engineering departments. Schools of business administration, like the University of Michigan, Dartmouth College and the Wharton School are including lectures and discussions. And a start has been made in the liberal arts colleges, like Princeton and Bryn Mawr, in courses in economics, social economy, personnel work, or psychology.

Increasingly we may expect men of the executive, personnel and supervisory divisions, as well as technical men, to know about motion study, endorse it, and cooperate in its use.

The *need* for it is evidenced by the shortage of skilled workers today, as proved, for example, in the study made by the National Industrial Conference Board of the metal workers in New England. Also by the shortage of trained men to install motion-study work and laboratories, and by the low level of job analyses, personnel work (which fosters morale), "preliminary training" and "continuation training," adequate placement and promotion, and many other activities which have been decreasing during the depression, with bad effect on industrial morale.

An adequate system of training in motion study in any industry or any organization includes *all* groups. Unless it reaches top executives and the table round which final decisions are made, it cannot be sure of continuity, a field of application, and then maintenance of its results. Unless it extends to the newest and to the oldest worker at the simplest job, it has not permeated the thinking of the organization thoroughly, and cannot be assured of continuity and creative progress.

The training must be planned by an expert in such work. It should be led by someone who knows what should be done, and who is a leader, an enthusiast, well grounded in the theory, at home and if possible a participant in the practice, but above all a teacher in the best sense of that word. He should be at the same time a student, so that his material is up to date, and so that he may present it not only clearly but persuasively. In saying that the training should be given by a leader, one means that reading plus lectures is not enough, far less orders to do one's work by pre-determined motion-studied methods. There should be vivid presentation of the material, with easily understood case illustrations,

and then discussion, conference, followed perhaps by debate, round table or panel—whatever device for having every member of the group participate is newest and most acceptable and appropriate to the group.

Key people of course receive special attention. Allan Mogenson in his "How to Set Up a Program for Motion Economy," *(Factory Management and Maintenance,* November, 1935), has developed effective procedure here. It is obvious that just carrying through what the foreman will plan and initiate implies helping him teach the workers, and enabling supervisory and executive understanding and co-operation.

As in all effective learning, motivation must be considered. The man must want to be taught, incentives must be provided. This is a prerequisite. The teacher can provide interest, perhaps even inspiration; the organization must provide opportunity to learn and to use, and rewards for both learning and using.

If the members of the organization who belong to group 2, that is, engineers likely to be interested in the application of motion study to many fields, are known and available, they may be trained and a motion-study laboratory installed while the motion-mindedness training is going on. Otherwise this training is valuable in locating such men. Specialists are likely to appear as group 2 is trained, and thus be available for a group 1—they may even be found as possibilities or probabilities in group 3. Or the specialists can be secured from outside, though one always hopes for one or more from inside, because he will know the organization problems intimately. Such a possibility, if found inside, may be sent outside for training or experience, if that is most efficient, or trained inside.

The results of such intensive and extensive training as here outlined will depend partly on the effectiveness of the industrial relations within the organization, partly on the state of management, partly on the teaching and partly on the learning, etc. This paper has not seemed the place to give detailed curricula or teaching schedules, as these are available in other places. Reading should, wherever possible, be supplemented by visits to plants where such work is being done or has been completed.

In general, the results have been proved to include the following:

1. Workers whose knowledge of time and energy saving is increased
2. Practical applications of the work
   a. to the student's own job
   b. to the jobs of those whom he directs
3. Savings, some large, many small, but adding up to very profitable totals
4. Added interest in work
5. Conservation and development of skill
6. Increase of safety
7. Increase of morale
8. Improvements and inventions
9. Better "group work"—that great desiratum today
10. Improved industrial relations.

Note that these come from within,—this provides maintenance and the incentive for progress!

OVER-ALL MOTION STUDY

By F. J. VAN POPPELIN
Industrial Engineer, Remington Arms Company, Bridgeport

Mark Antony once said, "I come to bury Cæsar not to praise him," and so I too come today not to praise but to mourn what I consider untimely over-emphasis of certain phases of motion study.

I believe we all agree that the object of employing motion economy in industry is to improve existing conditions and reduce unit cost. You will agree with me that the success of this technique is measurable in direct proportion to what we are able to achieve in reducing unit costs and improving working conditions. Mogensen, in his "Common Sense Applied to Motion and Time Study," states that both Taylor and Gilbreth implied that the goal of motion economy is primarily an elimination of waste in industry. Naturally, it becomes essential to find out just what this technique consists of and what it covers.

The technique of motion economy ranges from the problems of shipment of raw materials to the plant, from the flow of work in process through the plant, from the finished product to the consumer, down to the smallest hand operation which only a camera can reveal. The question arises as to where our analysis shall begin. Shall we begin by analyzing small hand operation setups by means of close micro-motion study or shall we begin by looking at motion in its entirety as it affects the plant?

There is only one criterion, only one yardstick which determines the approach. This yardstick is not the ratio of savings to cost alone but also the magnitude of savings to be achieved in the shortest time possible, assuming a profitable return on the investment.

The over-all motion economy approach requires a

comprehensive study of problems covering centralization or decentralization of plant facilities, layout, process and product analysis, scheduling and routing, time study, motion study, etc.

The problem of plant location, centralized or decentralized, necessarily applies only to the larger industrial units. You will agree with me that it would be foolish to concentrate analytical effort on micro-motion set-ups when the entire plant structure and geographical set-up is such that considerable losses are incurred annually. After this problem has been satisfactorily solved, each plant has to be studied from the point of view of motion efficiency.

But before getting too deep into motions, we should in most cases give some thought to the design of our product. All too often, I believe, most of us are prone to start out applying the principles of motion study to the assembly operations when we should be spending our time on redesigning the product and thereby reduce the number of pieces required in the assembly or to redesigning it so that the assembly operation is simplified or so that no assembly is needed. The trained motion-study man probably looks at a finished product somewhat differently than the designer. They both have something we need in American industry, and I for one favor the idea of motion-study men temporarily ignoring or at least reducing the amount of time given to refining the last motion of operators and using more of their brain and ability on product design.

A short time ago I had occasion to spend some little time visiting a plant where several motion-study men had been engaged for months in teaching operators how to use their right and left hands most effectively. They had arranged to preposition tools and stock, had employed drop deliveries wherever possible and all in all gave the place the appearance of being quite up to date, at least with respect to minimizing motions of operators. They had reduced direct-labor costs approximately 25 per cent. In the meantime, however, competition had grown so that a 25 per cent reduction in direct-labor costs meant little when one considered the fact that they were losing money on every sale they made before starting their motion-study program.

The real trouble of this concern was too much variety and therefore low volume in all patterns. They wisely hesitated to announce to the trade a large reduction in their number of patterns for fear they would lose all their business through lack of dealer interest. The solution was to concentrate on mechanizing the methods on a limited variety of patterns to a degree where so much value could be offered as almost to force lack of customer interest in the balance of the line. They were rewarded with large volume, low costs and profits. The motion-study men had been barking up the wrong tree and management was none too pleased with the results they had obtained.

Plant layout is the next step in our analysis of determining motion efficiency. It is common knowledge that a poor layout will result in high operating costs. These high costs are reflected in high taxes, depreciation, maintenance, rents, supervision, direct and indirect labor, etc.

Motion-study training will result in motion-minded men who can be of great assistance to management in pointing the way to lower burden costs which are all too often considered fixed costs. In most industries burden costs are much higher than direct costs and therefore offer greater possibilities for reduction. I am going to emphasize that I think too much stress is being laid on motions of operators on assembly benches, etc., and not enough on those cost items which are of greater importance.

Scheduling and routing definitely tie in with motion economy. We all know that scheduling and routing are the difficult jobs which confront most industries, and any system which is poorly set up or planned will result in a costly lack of motion efficiency, regardless of how good the layout might be, how excellent the processes are analyzed and set up, regardless of how well the product is designed, and finally, regardless of how fine a micro-motion program has been devised.

Time and motion study are the Siamese twins with which we are all familiar. It is the standard practice to analyze a job from the standpoint of motion efficiency before recording time. In a good many cases, it had been found that whatever motion there was seemed quite efficient, but there was not enough motion on the part of the operator to make his presence economically justifiable. So it was not a problem in this case to reduce the motion in order to make it more efficient but to find more work for the operator in order to get as high a machine and man utilization as was possible under the circumstances.

Many plants follow a practice of arranging the equipment so that a man can operate a series of machines in such a manner that an efficient rotation of activity is attained by synchronizing the necessary machine attendance times. You may call this time study or you may call it motion economy. I know of several cases in the last few years where large savings have been ob-

tained in this manner without resorting to what is strictly known as motion study.

Let us assume that we have successfully answered all considerations discussed so far and are now ready to do a real motion-study job. The first thing to do is to determine the amount of time and expense involved to attain savings by motion study, particularly of the more refined kind, possibly employing micro-motion principles. In this manner many pitfalls will be avoided. It has happened time and time again where a six-inch gun was used to shoot a sparrow. Of course you know what happens when practical shop men witness such a demonstration. In other words, the refinement to which the motion study set-up should be carried must be in direct proportion to the savings to be realized. It is seldom advisable to stick with the set-up until that last few per cent have been realized, for the simple reason that the last few per cent will show a decreasing return on the investment. Of course this does not apply in every case. There are, no doubt, industries where the number of repetitive operations is so great that even a small reduction in unit costs by motion study set-ups will result in considerable savings. In such cases a refined extension of this technique is no doubt justified. However, a refinement of motion-economy principles and their application ceases to be economically justifiable whenever a more lucrative application of this technique, probably in its coarsest form, using an alarm clock and a sixty-foot rule, is held in abeyance, just because the motion economy engineer is tilling submarginal soil somewhere else in the plant. And it is this submarginal soil about which a great many reams of paper and much good time and money are being wasted to bring forth scragly looking vegetation while fertile land nearby goes unplowed.

I sometimes wonder if American industry is ready for motion study, particularly in its ultimate refinements. My own experience is that by a study of motion economy principles I was made more aware of faults existing in present manufacturing methods than in the lack of synchronized motion, etc., on the part of hand operators. The result is that I have been so occupied trying to get ready to apply motion study, that the fine points of this technique become more remote every day.

In our company this getting ready has yielded such good returns as compared to the returns on the final step taken on comparatively few jobs, that it seems almost poor judgment to spend the company's money on doing a good motion-study job. The most lucrative activity we can indulge in at the moment is "getting ready." I do not know when we will get around to making right and left hand charts and seeing to it that motions are simultaneous and in opposite directions, etc. Personally, I do not believe that I will live long enough to reach a point where I will feel satisfied that the yield from refined set-ups will be greater than the yield from the time and efforts spent in continuing "to get ready." Let me review what this getting ready consists of. I think a series of questions is the best way of doing this for if there is one thing I have gotten out of motion study it is the ability to ask questions.

Use: What is the purpose of the product?

Design: What should the design be to fulfill the purpose?

What is necessary to give it sales appeal? How should it be wrapped and packed, etc., when delivered to the customer? How can variety of line be secured and still keep parts standardized?

Materials: Of what materials should the product be constructed to fulfill its use, for durability, for sales appeal, for cost, for ease in processing, and for sales value of salvage material?

Quality: What are the quality requirements with respect to structure, dimensions and finish? Interchangeability of parts?

Process: Should we endeavor to manufacture on existing equipment? Should we design new equipment? What equipment can we purchase? To what extent can we use automatic equipment and what should be the sequence of operations in order to obtain a quality product at low cost? How can we design the tools and fixtures to avoid delays and ease in operation?

Personnel: What is the attitude of our supervisors and workmen? What can we do to improve it? How can we secure their whole-hearted co-operation?

Instruction of Foremen and Workers: What instruction should we give them and who will do it?

The foregoing questions and many others constitute the "get ready" part of a sound motion-economy program. Let us now examine how such a program can be put into effect with commendable results.

It must be recognized that to attain any measure of success, we must convince the key men of the organization that a motion-economy program is sound and practicable. We should never lose sight of the fact that we are dealing with hard-hitting practical men who have won their spurs right out in the thick of it. It must be remembered that these men have the empirical approach with all its advantages as well as limitations.

Management and supervision have to be convinced of the following:

(1) the practicability of motion economy technique,
(2) quick results,
(3) the proper ratio of savings to cost,
(4) the magnitude of savings, and
(5) the psychological appeal of this program to supervision and worker alike.

By practicability of technique, I mean that the principles involved are readily applied in a general way to the industrial activities within the plant. This implies that no highly specialized language and paraphernalia be employed which will make this program appear as a part of some magician's equipment, but it is essential that the approach is of the common-sense variety, the practicability of which is most obvious to almost everyone concerned.

Naturally the program of practical immediate results will be expected. It is hardly necessary for me to point out that long-drawn-out, refined analysis of minute motions will require considerable time and money before tangible results reward the effort. It is essential that the first impression be a good one. Let us assume two alternatives. One engineer enters a plant and proceeds to "get ready" for a motion-economy program. He studies the requirements as to design, material and process of the component parts and finds that certain parts made of die castings could be successfully replaced by pressed steel parts requiring little or no machining as against the die cast part which required a series of machining operations. He didn't even get as far as motion study of the machining jobs—they were eliminated before he got that far. Now let us look at another man who tackles a bench operation and proceeds to develop right and left hand charts and probably a motion picture, and then proceeds to teach a new method to an operator who had little inclination to change old muscular habits. In addition to that let us assume, to make this case look as bad as possible, that the operator is aware of the skeptical twinkle in the foreman's eye. It requires very little imagination to realize which one of the men has made the best impression and will continue to make the most progress.

Applying motion economy means investment of money. This investment must be governed by the yield expected over a reasonable period of time. The nature of the industry and product will determine allowable minimum returns of the investment.

Regarding savings, first things should come first. By this is meant that large savings should be obtained first before any time and money is frittered away on model set-ups of small importance, except probably for educational purposes. This may sound too simple and obvious, but it happens only too often that large-scale savings are overlooked because the engineers got lost in perfecting a minor improvement.

Another factor, and not by any means the least important, is the psychological appeal to supervision and workers of such a program.

Naturally, you may suggest that if supervision has been properly instructed and sold on the idea of motion economy, resistance will be minimized to a negligible point. I agree with this fully but also realize that it is almost a theoretical assumption to think that supervision and operators can be readily sold to any such program. There are cases where the management will back up a motion-economy program to such an extent that any resistance thereto appears to be heresy.

From the foregoing you may conclude that I am apposed to micro-motion study as such. This is not the case, but I do believe that there is a definite tendency in industry today to resort to the use of motion study in order to reduce the manufacturing costs when we should be concentrating on a number of other elements. I feel that the day will come—I don't know whether you or I will live to see it, when our biggest returns can be secured in industry by resorting to micro-motion study or a very thorough study of all elemental motions made by all our workers. The point I want to make clear, however, is that we are not yet ready for this sort of thing. Neither our supervision nor our workmen have been trained to the point where they are willing to accept the principle that we should refine all our jobs down to the most perfect set of motions which we can possibly devise. They are aware that there are many other ways in industry to reduce costs, and they cannot quite realize why we should concentrate on getting the last possible motion eliminated from the workmen on the bench and machine.

Not only does supervision and worker alike realize that this refinement of analysis is premature, but management is of similar opinion in most instances. It is my conviction that management is absolutely correct in demanding that the large scope of motion economy principles be applied first.

MOTION STUDY IN THE OFFICE

By R. P. BRECHT
Secretary, National Office Management Association

The basic principles of motion economy are as applicable to many office operations as they are to factory

work. There are cases on record where most satisfactory, if not startling, increases in clerical output have been made, comparable to similar increases in factory work. Where motion study is applicable, there is the same opportunity for its use in the training of office workers; the same need for protecting the worker against fatigue of useless motions; the same advantage of stimulating interest and suggestions by making both the supervisory force and the clerical staff "motion-minded"; the same urge to secure from operatives maximum production. The case for motion study has been clearly demonstrated over a period of years. All of its values in use have been so completely explored and described in the literature on the subject that a mere detailed repetition of their applicability to the office would be of little significance. What I propose to do, therefore, in this paper is to discuss briefly the opportunity for extending the use of motion economy in office work and some of the obstacles that confront the office methods engineer in his endeavor to apply it. For despite the fact that there is an increasing opportunity to employ motion study, the number of companies actually using it, certainly in its formal aspect, is relatively few.

Furthermore, I cannot agree with the recent statement of a management engineer actively engaged in office installation work that the office methods man is making a serious error when he attempts to borrow from factory practice such refined techniques as motion study. This statement is much too broad and should be qualified as I hope to modify it in this paper.

Now there have been forces at work, particularly during the past ten years, which have served to widen the possibilities of using motion study to good advantage in the office. Among them are: (1) the increasing use of office machinery, which carries with it in many instances the establishment of repetitive, routine jobs; (2) the tendency to divorce the "thinking" from the "doing" elements of clerical work, thus making possible, again, routine, repetitive work in connection with the "doing" part, and freeing it from the largely uncontrollable and unpredictable influence of the thinking aspect; (3) the widening practice of measuring clerical output which definitely requires the establishment of output standards; (4) the increasing use of financial incentives which, in turn, is dependent upon measurement and the setting of output standards; and (5) the very real drive towards better control of clerical output being undertaken in many offices. All of these forces are focused on the basic point of clerical output which immediately establishes the importance of motion study to them. Yet despite this growing opportunity, certain differences between factory and office operations present obstacles in the path of the office methods man which are very real and which must be conjured with. These difficulties arise, first, from the attitude of the top management, certainly from those higher executives who control the work of the methods man; and secondly, from the nature and peculiarities of office work, itself.

The fact that the office department is essentially a service unit leads many executives to believe that internal economy within the unit is of secondary importance to the service it renders. In short, they are afraid that a too vigorous retrenchment program within the office may prevent it from facilitating the work of other departments, and hence lead in the end to an increase in operating expense which may more than offset the clerical savings. For example, a few years ago the traffic department of a manufacturing company was completely reorganized, measurement of work was instituted, output standards established, financial incentives introduced with a final net saving in the clerical expense of the traffic department that was most satisfactory. Yet, over a period of time it was finally demonstrated that the actual cost of shipping orders had increased because under the pressure of the economy program the traffic clerks were not selecting the most advantageous shipping routes. The determination of the top management to protect the service aspect of the office is, I believe, essentially sound, but it is in no way a conclusive argument against the use of any management device which will enable the office to render its service more economically if such device is employed carefully and in full recognition of all interdepartmental relationships. Yet many top executives will seriously protest the use of motion study on this ground. Again, the higher executive may feel that the "tighter" standards resulting from the use of motion study may be misunderstood and resented by his employes, may not "work" in practice, and may in the end shatter completely the morale of his office staff. This, too, is an argument that may rest on fair grounds if the office methods engineer approaches the employe in the wrong way, uses an unjustifiably expensive technique and establishes his standards without recognizing all of the variables affecting the work; but such a result is not inherent in the use of motion study, rather in its misuse. In the final analysis, however much we may argue that such an attitude of the top management is ill-founded, arising from unfamiliarity with motion-study technique, fear of the new and untried idea and similar causes, it

is a very real and trying problem to the office methods man. He must proceed cautiously, adopt the simplest of techniques and be satisfied in many cases with modest results until he wins full support from the higher executive level. Moreover, excessive zeal to show large economies must at times be curbed when there is the slightest doubt about attaining them. It is quite as important to keep office costs per unit from rising, particularly at a time of advancing business activity, as to strive for large savings. The "hold-your-own" argument may at times be very effective. Moreover, it must be apparent that these attitudes reflect the comparative newness of the vigorous drive for clerical productivity on a wide front.

However, even with the full sympathy and support of the top management, the office methods engineer must recognize certain peculiarities in the very nature of office work which mark it distinct from factory operations. These are: (1) the fact that an operator may shift frequently from one task to another during a relatively short period of time, (in short, there may be an inadequate volume of work for steady and continuous operation); (2) even though an operation may be described as routine, the operator may be called upon to handle each unit of work in a variety of ways, thus preventing him from getting full and complete rhythm in his work; and (3) certain types of office jobs do not lend themselves as readily to motion analysis as others.

This last point can perhaps be brought out better by setting up a rough classification of types of office work. Class 1 would comprise hand work, such as sorting cards, or pulling carbons from invoices, separating the copies and clipping to one copy certain supporting data sheets. Class 2, mechanical work, such as the operating of a bookkeeping machine, a tabulating machine, an addressograph, etc. Class 3, mental-hand work, such as the hand posting of visible inventory records, striking balances, comparing last balance with the ordering point, flagging the account to indicate various dispositions of it, or taking complaints from customers which requires on the manual side the filling out of a form and on the "mental," giving the customer satisfaction and carrying the adjustment to as near completion as possible. Class 4, mental-mechanical operations, such as the "translation" and interpretation of customer language into shop terms in the writing of shop orders. Class 5, mental work, such as the work of a statistical clerk in interpreting reports or an accountant in analysing a statement.

The object in setting up this rough classification of work is to drive home the point that the opportunity for the most effective use of motion study will lie with those jobs that are primarily of the routine hand and mechanical types—Classes 1 and 2. This, of course, presupposes that the volume of work is sufficient to give a certain amount of steadiness and continuity to the operation. The moment the "mental" aspect enters, the office methods man is confronted with a side of the job which is largely uncontrollable and may be predictable only within wide limits. (I am using the word "mental" in a very loose sense to include that part of the work which involves the making of calculations, judgments, decisions, etc.). Classes 3 and 4, then, may lend themselves to motion study or prove disappointing areas for analysis. Class 5 should be approached with some latitude, if at all. In short, no device for revamping the mental "motions" of the thinking process has yet been developed. The seriousness of this difficulty will depend upon the relative proportion of the manipulative work as compared with the "mental" work. With a large proportion of the "mental" it is perfectly possible to work out a very satisfactory saving on the actual physical motions and yet have this gain largely offset by slowness of the operator on the "mental" aspects of his job. It is the latter side of office work that has discouraged many attempts to introduce motion study. However, here again it is unfair to come to the hard and fast decision that motion study will be of no real value.

On all types of operations there is a certain proportion of "get ready" and "put away" work, performed by the operator. The cycle of motions involved in these general elements of the work can certainly be made the field for investigation. Moreover, the general arrangement and characteristics of the workplace may be a handicap or an asset to the operator on any class of work. The important things to be kept in mind then are that all types of office work are not as fruitful in producing savings and that the type of motion study employed should be adapted to the class of work.

Based on practices followed by various companies four types or methods of motion study can be distinguished: (1) what might be called for lack of a better term, informal motion study, (2) simple motion study, (3) the micro-motion technique, and (4) motion-time analysis. The last is so completely concealed within the protected professional precinct of its protagonist, A. B. Segur, that it can be dismissed from further consideration as not being free and available to the office methods engineer without a tremendous amount of re-

search. The first three types differ primarily in the detail and exactness of the motion analysis.

I venture to say that most of the companies establishing output standards for office work use what I have called informal motion study. For effective results, this method requires that the analyst have a definite knowledge of the principles of efficient motion and of workplace design. The purpose is to eliminate the most glaringly wrong motions of the operator and to rearrange materials and work so that his motions are patterned or conditioned by the workplace. Thus he must perforce follow a generally effective cycle of motions. Obviously such a method will not produce the ultimate in the "one best way," and yet in the hands of a capable analyst it may result in very definite improvements—quite as much as the nature of the operation and the volume of the work may warrant.

By simple motion study I refer to the analysis of motion by means of simo-charts picturing the motions of the most obvious moving members of the operator's body such as his hands. There is involved a definite technique of recording and analysis in this method which is simple but very effective. It has general applicability where the nature of the operation and other factors justify detailed motion analysis. It should, and will have, I believe, an increasingly wider use in practice. This simple simo-chart analysis must, of course, be bulwarked with information concerning the equipment and work center, but a short description, a rough sketch, or analysis of the chart directly at the machine or desk may be ample for such purpose. The Westinghouse Electric and Manufacturing Company increased the production of clerks, who duplicated orders, 90 per cent by a simple motion study which led to a radical change in the arrangement of equipment. It is used effectively in the Atlantic Refining Company and other institutions. Obviously this and all methods of motion study require a thorough understanding of what constitutes effective motions and the methods man must possess such other attributes as are required of a first-class analyst.

Micro-motion study, associated with the name Gilbreth, is, of course, the most accurate and thorough method. The technique needs no elaboration here. The most serious objection to its adoption as the day-to-day method of analysis is its costliness. For to the cost of equipment, which, it is true, is no longer prohibitive, must be added the time required of the analyst. Certainly this has proven an obstacle to its use in many cases, and only a few companies have employed it in office work; outstandingly, R. H. Macy & Co.; to a very limited extent, the Standard Accident Insurance Company and the General Electric Company. It will find most advantageous use in connection with routine, rhythmic work on which the volume is sufficient for continuous operation and where clerical payroll is large enough to offer real savings. However, it does have other uses for which it is peculiarly fitted which may justify its adoption in some cases. The motion-picture film is about as effective a way as can be devised for arousing interest in the subject of motion economy. Moreover, it has and will continue to have a very real value in training clerical operatives, if certain tendencies, manifest now, hold for the future. During the depression office executives by and large were very much interested in developing versatility in their office workers. Moreover, certain types of control plans such as that used in the offices of Bauer & Black require the continuous shifting of employes from one operation to another, even across departmental lines, to meet fluctuations in the daily volume of work. Of basic importance to such a plan is, again, versatility of the work force. Certainly on complex operations the motion-picture film should prove of great help in developing such versatility as quickly as possible.

One further thought on training—a "desk-trainer," having very interesting possibilities, is being experimented with by L. H. VanNess of the Acacia Mutual Life Insurance Company. Actual photographic reproductions of each frame of the motion picture are fastened to holders which in turn are mounted on a spindle, the whole "wheel" contained in a metal casing with an aperture at the top. When the wheel is rotated at the proper speed, the worker, glancing into the opening at the top of the casing, has before him a complete moving picture of the operations. This device can be placed on his desk and can be referred to whenever necessary during the training period.

In conclusion let me summarize the main points of this paper. There is a rising opportunity for the use of motion study in office work but so far only realized in part. The attitude of controlling executives and the difference between the character of office and factory operations are limiting factors. Neither is insurmountable but requires care and a high degree of intelligence on the part of the office-methods engineer. Common sense in choosing the motion-study method to be followed, common sense in applying it, common sense in proclaiming its possibilities, common sense in recognizing it as but one of a number of devices he carries "in

his bag of tricks" must mark the effort of the methods analyst. Otherwise serious complications may follow, which finally deny him a most helpful aid and deprive the company of a fruitful source of economies.

MOTION STUDY IN THE FACTORY

By HERBERT C. SAMPTER
Blaisdell Pencil Company, Philadelphia

Particularly in the factory, most of us are apt to think only of a hand motion analysis when the term "motion study" or "motion economy" is used. Whereas in the factory, as any place else, "motion study" should mean an investigation to eliminate waste motions in a process as a whole, in a part of a process, in an operation as such, and only finally a detailed study of the hand and body movements. As Dr. Gilbreth has said in the past, if Mogensen in his book quotes her correctly, "There is too much study of work that should be eliminated, not studied." In building a bridge no one would start the detailed design, let us say of piers, without first making a general survey of conditions to determine whether or not piers are needed.

So in the factory as in any other application we have over-all motion study, and job motion study.

Over-all motion study in the factory should lead to economies along three lines. Economy of direct labor, of indirect labor, and of materials in process. These three factors are represented in general on our process charts by the operations, moves and storages. If our processes conform to the following three laws, we will attain the maximum efficiency of any job as a whole. Last fall I formulated these laws because I felt that a talk, which I was asked to give to our local chapter on the laws of motion study, would have to include laws of over-all motion study as well as the twenty Gilbreth Laws, which of course apply more specifically to detailed job analysis. As I knew of no such laws, and was not able to find any, I proposed that:

1. The best motion economy of direct labor is attained when the number of individual operations are a minimum and the sequences of operations are such as to require the least amount of handling.

2. The best motion economy of indirect labor, and general expense, is attained when the number of moves are a minimum, and as short, simple and automatic as possible.

3. The best motion economy of materials in process is attained when the delays, and storages, both permanent and temporary, are a minimum.

In the factory we can conform to law one, not only by eliminating unnecessary operations, equivalent to the keeping of records in an office which are never used, but we must keep in touch with new developments in processes which might eliminate work, as for example, the use of bright nickle to make buffing unnecessary. Combining may be made possible by using different equipment as, for example, a multiple spindle drill instead of a single spindle drill. The changing of the sequence of operations may make possible their elimination or combination, and even if it does not permit the elimination or combination of operations, a change of sequence often permits a saving not only in handling between operations, but in the operation itself.

The second law is somewhat similar to the "Law of Flow of Work" as given in Alford's "Cost and Production Handbook," but this mentions only distance between operations. Changes made to conform to law 1 will of course also affect the number and types of moves. But regardless of changes in the operations, great savings not only in the actual labor of handling, but also in supervision and space required, can be made. Hence general expense can be minimized by conforming to this law. To make the moves as simple and automatic as possible we naturally think first of conveyors, but we must guard against going too far with these. Mogensen points out that in 1927-29 the country went conveyor "mad." One of the large electric companies built eight miles of conveyors for their refrigerator line. These conveyors are now idle, not for lack of work but because it was found possible to do the whole job in a comparatively small room. The lumber mill which supplies the slats for our wood pencils found it could save labor by discarding its conveyors and using lift trucks instead. Elevators in a factory are always a poor means of transportation, not only because of the slow speed of most freight elevators but also because of the unavoidable delays in waiting for the elevator.

Here we also have a tie-up between law 2 and 3. Delays at elevators as well as delays or temporary storage between operations increase the quantity of material in process and hence the idle capital required. Straight line or conveyor production is of course, the ideal, but where this is not applicable, it can often be closely approached by balancing the various operations. Permanent storages should also be eliminated where possible. Mr. Parton told us at one of

our local meetings, of how the shipment of bodies for the Ford assembly plant at the coast are scheduled so that on arrival they can be put directly on the assembly line.

Over-all motion studies, and these laws apply also to a part of a job done progressively by a group, as for example, an assembly line which can be regarded as a complete job in itself. A flow type of process chart can be made for the assembly operations, moves, etc., and then studied for possible eliminations, combinations, or changes of sequence, which may be advantageous. In treating such a part of a process as a job in itself, we must guard against forgetting that after all we are dealing with a section of a whole; because even if the job as a whole has been previously studied, changes made in a more detailed study frequently make possible changes in the job as a whole which appeared to be impracticable before, or perhaps were not even foreseen.

So much for over-all motion study in the factory. As to job motion study, again, I believe we are too prone to think first of such jobs as assemblies and hand-fed machines, which lend themselves readily to hand-motion analysis, and to overlook the gains which can be made by applying motion study to such jobs as loading a freight car, oiling machines, weighing, etc. Such jobs might be classed as service operation, and are best analyzed by making a process chart of the worker, rather than of the part. Particularly in the factory we must also study operations done on the larger machines, and those which are done more or less automatically; as for instance, work on large machine tools, requiring cranes or groups of men to handle the parts, feeding ovens, and the operation of screw machines. Here our best tool for analysis probably is the man and machine chart.

Although I have emphasized the broader aspects of motion study in the factory, I do not mean to minimize the importance of detailed motion analysis of hand and body movements, which in many cases should be applied to the types of operations which I have mentioned, as well as to work on hand-fed machines, assembly and inspection. The ultimate answer to any manual operation, of course, is the automatic machine, but the development of special automatic machinery is expensive and can only be justified where there is a large production which is reasonably certain to continue over a period of years. However by making a motion analysis and possibly building a few comparatively inexpensive fixtures, frequently up to 80 per cent of the savings which could be made with the use of automatic machines can be attained, and in a much shorter time.

When making these detailed motion studies we should also keep in mind the operation and process as a whole. For just as a change in a part of a process may make changes in the whole procedure possible, so changes in the detail of a job may permit changes which could not be considered before. In working out a method for assembling a fountain pen lever, ring and barrel at New York University some time ago, we set out to solve this one problem only. As the job was being done it could not be combined with the next operation in the line. However after we had developed a new method for doing this assembly it became evident that at the end of the job as NOW done, the barrels were beautifully prepositioned for the next job of assembling the spring, and so these two operations were combined into one.

Particularly hand work, but also possibly the process as a whole can be materially affected not only by the design of the machines and fixtures used, but also by the design of the product itself. It has been said, quite truthfully, that motion economy should start on the drawing board. The designers of products and machines should have at least a basic knowledge of good motion economy, and before a new product or machine is made, it should be studied to see whether changes cannot be made, which would not harm the product or machine, and yet allow savings in their manufacturing or use. In this manner we would start right in doing the work in the "one best way" practical at the time, instead of working for a while comparatively inefficiently, and then improving the job subsequently. Motion study is not only a mechanism for improving work, it should be applied right from the start, when a new product is put into operation, or, keeping over-all motion study in mind, when the factory is built or laid out.

One other field for application of motion study in the factory, is in the factory office and for all the clerical work throughout the plant itself. Both the procedure required and the design of the forms themselves should be made to save motions, not only in the physical work required and of the movement of the eyes, but also of the mental work required.

To summarize: Motion study in the factory should be applied to the processes as a whole, to parts of processes, to operations as a whole, and to operations in detail. Furthermore, motion study should be applied to the various service jobs as well as to work actually on the product being made. It should be considered in the design of the product and also in the construction

of tools and fixtures. The factory office and factory clerical work can also be improved upon by the application of motion economy.

APPLICATIONS OF MOTION STUDY IN R. H. MACY & CO., INC.

By B. EUGENIA LIES
Director of Planning, R. H. Macy & Co., New York

Fortunately, the narrower conception of the possible application of motion study is more and more being replaced by Mr. Gilbreth's original conception, which is that motion study is the consideration of the total situation in any problem involving motions. The important part that motions play in business was once expressed by Henry Ford as follows: "Business is largely made up of motions. Reduce them and you reduce expense." We would like to emphasize these conceptions of motions and motion study.

Industry started its drive to find units of measurement and methods of measurement in the 90's with F. W. Taylor's attempt to apply the scientific method to work. In our opinion, retailing lagged behind because the old-time merchant was not technically trained and therefore was unfamiliar with the scientific method. In 1915, had one talked to the retailer of the possibilities of the application of the methods which had already proved successful in industry, he would have said, "My business is different, and because it is so dependent upon the weather, the season, the whim of the customer, the style of the moment, etc., it cannot be subjected to any method which makes a pretense of being scientific."

Here we would like to quote Taylor, who once said, "I use the term 'science' advisedly, having in mind Huxley's definition, 'Science is organized knowledge and common sense.' "

We agree to retailing being different and dependent upon many variables beyond control, even to the point of saying that because of these conditions it may be impossible to "predetermine the task" for many jobs. We would not agree that therefore the fundamental principles of "scientific management" cannot be applied. The officers of our company decided they could be applied and in 1920 we started research with the objective of eliminating waste, whether of energy or of materials.

We found that performing the work of retailing demanded a great number of motions. The opportunity for a wide application of motion study existed, for

A. A high percentage of the total cost of operating was spent for wages, and

B. A high percentage of the work performed for these wages consisted of motions made in handling: (1) merchandise, (2) papers—whether wrapping or office forms, (3) money and (4) machines (cash register, marking, bookkeeping machines, etc.)

We also found that while the style of merchandise varied, the same motions remained and that each motion was performed millions of times a year.

The number of motions made for an average transaction would run into the thousands, and are so many that a process chart of them would be longer than this room.

In retailing we have not only the motions performed by our employes to consider, but also the motions performed by the customer. We must sometimes attempt to make the motions more difficult, for instance, those of shop-lifting. Seriously, the motions of the customer is one of our most important problems, for it is the "avoidable delay" motion, to use a Gilbreth Therblig term, that affects the customer's opinion of store service and may cause a loss in volume. We have also the problem of making "selection" as easy as possible from both the customer and the store point of view. Traffic and transportation from floor to floor are both important motion-study problems.

If we begin with the motion which starts the cycle of getting merchandise into the store and finally in the consumer's hand, we would start with the buyer going to the manufacturer or to our sample rooms.

Then comes writing the order, the work of recording the order, the mail room, filing copies, etc. You can see that a few hundred motions are performed before we have the merchandise. Then we have the receiving of the merchandise, marking and storing the merchandise and the paying of the bill, etc., which means a few thousand more motions before we have the merchandise on the selling floor.

Then we have the transportation to the selling floor and stock arrangement to aid customer's selection and to reduce the motions of the clerk in showing merchandise.

We do not need to take you through the detailed motions of merchandise checking, packing, cashiering, delivering, bookkeeping, correspondence, statistics, etc., for it to be clear to you that a large part of the expense of retailing is due to motions. It is probably also clear that the type motions we have named can be subjected to motion study, some even to micro-motion study, with results which not only reduce expense and

allow for higher wages, but increase customer satisfaction, which eventually means added profits.

The length of this paper does not allow us to take you through a complete motion study of the work of one selling department, for this would involve the complete cycle mentioned above. We have chosen as an example the problem of the development of a central wrapping department and will attempt to show the results of the application of the principles of motion study.

The development of a central wrapping department involves many other problems than just that of the work of packing alone. It involves having the salesclerk make change and wrap the merchandise when a customer takes the package with her. This in itself is a big motion study and training job and its success is necessary before we can get savings from a central wrapping system. The inability to free the selling floor from merchandise checkers is a frequent cause for the failure of central wrap departments.

We will not go into the whole problem for we are afraid that we might become involved in the subject of stating the problem which would be an interesting paper in itself. A partial statement of the problem will serve our purpose here.

It can be stated as:

A. The elimination of forced idle time due to the enormous fluctuations in the flow of work to the individual floor merchandise checkers.

B. The gaining of the advantages of being able to pile up work in centralized packing units which allows for the continuity of work under standardized conditions.

In developing the central packing unit our first problem was to determine the approximate amount of space required and the best location from the standpoint of getting merchandise from the selling floors to the packing unit and from the unit to our delivery department. In selecting a location, we were guided by the principle that gravity is the cheapest form of transportation. To meet the principle we had to find a location for the unit on a floor below the selling floor and above the delivery department and so located that we could tap our present system of chutes. As this was of prime importance, we finally selected a place which was smaller than would have been ideal, but we had the advantage of being able to use the chutes to and from the unit.

Before starting with workplace layout we first concentrated upon ideal working conditions, as the selected room was below street level. This included installing good ventilation and light. We used desks and fixtures of light, unvarnished wood so that the entire place was bright and airy. We provided rubber matting on the floor to avoid the fatigue of standing on concrete floors.

We were then ready for the problem of layout. Our layout problem was to provide the most convenient method of receiving, distributing, wrapping and disposing of merchandise.

The main chute, which brings all merchandise from the selling floors, was tapped at one side to deflect all wrapped and unwrapped merchandise on its way to the delivery department. All of this merchandise is deflected on a slide table and dropped to a belt leading to the delivery department. At this point a boy stationed on this platform facing the belt and slide table picks up all zipper bags from the belt, allowing the wrapped merchandise to go to the delivery department. The boy throws the zipper bags on to the upper track of this conveyor which runs parallel to the slide table and which feeds two other conveyors that run at right angles to it. This belt is equipped with automatic starting and stopping so that he is able to distribute the work automatically as it is needed. Each of these two conveyors, that are at right angles to the first conveyor, carry the bags between two rows of packing desks where they are removed by the packer. The packer removes the zipper bags from the conveyor, which is the same height as the packing table. As the packer finishes packing one package and reaches for a new zipper bag she drops the wrapped merchandise into the lower belt, directly under the top one, with one hand and with the other hand takes a new bag off the upper belt. The lower belt of each series of conveyors passes under the upper belt (near to the floor) and goes in the opposite direction toward the main chute that leads to the delivery department.

We used the accepted motion-study principles to attain a minimum of handling on all work with a minimum of motions in the layout of the packing desk as we did for the layout of the room. Before laying out the packers' desks we made a very careful study of not only the motions of packing, but also the cost of packing materials. It often happens that you can add to the motions of packing and still have a substantial saving through a reduction in the cost of materials, so I want to emphasize here that the most economical way is not always the best from the standpoint of the best motions, for one often saves by paying more for labor and less for materials.

We then planned the arrangement of packing materials, the handling of materials and packing tools to eliminate unnecessary motions and to allow for motions

that are rhythmic and simultaneous in order to provide for a maximum production with a minimum of fatigue. In addition to the handling of the merchandise we made a detailed study of each operation in connection with the handling of the salescheck, that is, the check handling, tearing, and pasting.

In arranging the workplace layout we attempted insofar as possible to have the materials used the most often located in the most convenient place.

After we had the method completely standardized, we started with an intensive training of the individual worker in the new motions. As soon as this was completed we were ready for the setting of the task.

We finally set the task at a point more than 2½ times the production at the time of installation of new methods. One month after the installation of the central wrapping and standardized methods the average rate of production was slightly more than 50 per cent of the task. As we had set the standard at twice this amount and as that standard was based on what an experienced worker, mentally, physically and emotionally suited to the job, could accomplish by using the approved methods with an effort which would be maintained over the normal working period without undue fatigue, intensive training in correct motions was necessary and the incentive had to be such as would compensate the worker for this added effort. Our actual efficiency, after the training and experience, rose from less than 50 per cent efficiency to between 85 per cent to about 102 per cent over the period of a year after the installation. As a result of this motion study, the setting of a fair standard and the payment of a fair incentive, which meant that the worker had higher earnings, we reduced our costs about 35 per cent.

One of the aims of our central wrap was to eliminate idle time by piling up work ahead of the packer so as to insure a continuity of production. The personnel was budgeted so that a certain amount of work was always ahead of the packers but just enough that the packers completed their work in this unit at 6:30. One complication in the budgeting was the necessity of having all packages for the afternoon delivery completed by one o'clock. The merchandise for afternoon delivery was in zipper bags of a different color.

Before closing, I would like to say a little about the work of the salesclerk, which is the part of department store operation with which the layman is most familiar. To date, we have applied motion study to the problem of stock arrangement, seeing that fast-selling items are in the most convenient location and often in more than one location, to save the steps of the salesclerk and thus to give faster customer service. We have also standardized salescheck writing and in some departments have taken the work of filling the orders for merchandise to be sent, away from the salesclerk and placed it in a centralized order-filling division to allow the salesclerk to devote more time to the more skilled work of selling.

We have done other minor motion study work in this connection, but it is my personal opinion that the fundamental job of developing a real technique for the salesclerk so that the results of her work can be measured and compensated, is still to be done.

While we have many types of incentives for salesclerks we still have not done what we have for non-selling operations, that is, to apply the scientific method to the job so that we can give instructions as to what we want done under any given conditions. We have yet to define the fine balance between service to customers, volume and expense.

In 1915 the retailer said "No" to scientific analysis as applied to retailing. He has learned and is ready to make the next step. We are now on the threshold of this important work, and, in my opinion, when it is done we will have the same startling results that we have had from applying this method to non-selling operations. When this is accomplished we will be in a position to give you a much more interesting paper than this.

APPLICATIONS OF MOTION STUDY IN SEARS, ROEBUCK & CO.

By W. C. HARTMAN
Sears, Roebuck & Co., Philadelphia

If some one who is interested in learning about the application of the principles of motion study should visit first a large radio manufacturing plant and then Sears, Roebuck and Company's Mail Order Store, he would, no doubt, conclude that there is a vast difference in the nature of the work done by the two plants. And he would be right.

However, if he were to assume that because of the differences in the work there was little or no application for motion study at Sears, Roebuck and Company, he would be wrong.

In a manufacturing plant the parts of the product are submitted to a series of operations that result in the final assembly of the finished product. In our plant we submit orders to a series of handlings which result in the final assembly of a finished order.

Our store is divided into two sections—one section is known as the Office Building and it is in this building that most of the clerical work is done on the orders, and the other is called the Merchandise Building, where the merchandise is kept in stock bins.

The orders are transported in mail bags to the Office Building where they are weighed and sorted.

The next step is to open the envelopes, remove the order blanks, attach them to wrappers that carry them through the various handlings and facilitate sorting.

Orders for more than one merchandise department are known as "mixed." Those for one department only are called "singles."

The mixed orders are sent to an entry division where a mixed ticket is created for each department involved.

Both mixed and single orders are then sent to the pricing division, where they are compared with large charts to make sure they contain sufficient correct information for the merchandising departments to fill. From the pricing division they travel on a belt to the index division where the amount of money received is recorded on a card, bearing a stencil of the customer's name and address.

They are then scheduled with the time they must arrive in the shipping room and are distributed through pneumatic tubes to the various merchandise departments where the merchandise is picked from stock bins, rechecked for accuracy and dispatched by means of spiral chutes and conveyor belts to the shipping room.

After being weighed, billed and enclosed in mail pouches the orders are loaded on the trains that carry them to their destination.

I have selected four installations as examples of motion-study application at Sears. The first two are clerical installations and the next two are merchandise department installations.

As previously explained, all orders received for merchandise carried in more than one department are sent to the entry division for the purpose of creating a "mixed ticket," for each department.

Typists copy the catalog number, quantity, description, color, size, price, etc., from the order to these mixed tickets.

A study of this activity disclosed several unsatisfactory work methods.

The most important disclosure, however, was the fact that considerable unnecessary information was being entered on the tickets.

Most customers give a pretty complete description of the articles being ordered. Some even copy all the sales promotional information contained in the space devoted to the description of the merchandise in the catalog.

This is not essential to the filling of the order.

The catalog number immediately describes and classifies the merchandise. The size, color, weight, year, make and model, type of finish, etc., are, of course, imperative.

However, it is not necessary to completely spell out the words used to describe the merchandise. Abbreviations and symbols serve the same purpose admirably.

It was not the discovery of the possibility of abbreviations that proved valuable, but the proper use of them. Abbreviations had been used for some time but there were still too many superfluous entries.

Every time a typist strikes a key on her machine she makes at least two motions.

Every time she strikes keys to provide unnecessary information, she is wasting motions.

Therefore, if the number of strokes could be reduced by eliminating unnecessary entries, the number of motions would likewise be reduced. We therefore prepared a list of standard abbreviations.

This list was given to each entry clerk and it provided as many standard abbreviations as possible.

For instance, names of colors were dealt with as follows: American Beauty became Am Bty, and Copenhagen was shortened to Cop. Sizes were abbreviated in this manner: Height—Ht, Weight—Wt. To indicate measurements, G is used for Gallon, Oz for Ounce, Pt for Pint, etc.

To aid in carrying out the program of stroke economy, symbol keys were attached to the machines such as: yd, dz, prs, (") inch, etc. It is impractical to list a standard abbreviation for every possible entry. Therefore, we provided a list of eighty-five examples of merchandise abbreviations: Al for Aluminum, Awn for Awnings, Bat for Battery, Fl for Flannel, Hdkf for Handkerchief, Pat for Pattern, Ox for Oxfords, etc.

To illustrate how this works, we will take a typical example of a customer's order for a piece of furniture. The order describes a certain chair as follows:

2710—Club Chair covered with homespun tapestry in Dark Mulberry, Walnut Frame $19.50.

The entry will read like this:

2710—1 Tap Dk Mul Wal 19.50

The catalog number immediately describes the article as a Club Chair. A Wing Chair would be 2711. A Throne Chair 2712, etc.

"Tap" describes the covering because this chair is sold only in tapestry, velour and mohair.

"Mul" is sufficient to describe the color because the colors are limited to mulberry, green, rust and rose.

"Wal" is all that is necessary to describe the frame because there are only two types of frames—walnut and mahogany.

The original entry would involve the use of sixty strokes or 120 motions to duplicate. The new method requires but twenty strokes.

Standard abbreviations were the most valuable contribution to the savings of motions in this department. They resulted in a decrease in the number of strokes necessary to enter an order, and a stroke saved for a typist is as valuable as a motion saved for a girl assembling a piece of electrical equipment.

In addition to reducing the strokes about 25 per cent, several other changes in methods were effected. For example:

1. The typist inserts the tickets in the front of the roller and revolves it so each completed ticket as it is turned out lays against the name plate of the machine. In this way, five or six sheets may be removed for the pin-up operation with one grasp and transport.
2. Twenty orders are placed on the copy holder at one time instead of three or four.
3. Instead of crossing off each item from the order as it is copied, the girls may now cross off only when there are six or more. Orders average five items.
4. A fiat disposal tray into which the finished orders could be tossed replaced a vertical rack that required a deliberate insertion.

When study was started in this department it had been in constant operation for over fourteen years.

During that time, many changes in handlings and procedures had been made that resulted in increased outputs. The divisional output was 163 tickets per hour with .6 per cent errors.

The changes just described together with the bonus have resulted in a pick-up of 58 per cent in output, the divisional average after eleven months being 260 tickets per hour.

The present error percentage is .3, a reduction of 50 per cent over the former figure.

An important phase of the preparation of orders for filling is the activity of pricing. The pricer's function is to compare the orders with a large chart that contains all the information necessary properly to fill the order and the latest prices. From the charts the girls can tell immediately that the merchandise is mailable or that it must be shipped freight or express. It gives the weight, price, size range, colors and patterns and the unit in which it is sold, such as dozens, 3 for 5c, 4 for 10c, $4.00 each, etc.

It is necessary to submit the orders to this check because the customers frequently order from old catalogs, requesting discontinued merchandise, or giving the wrong price. They omit necessary information, get the catalog numbers mixed, and order colors and sizes not listed.

Originally the pricing chart which is mounted on a vertical rack was positioned diagonally across the desk with the left end nearest the pricer. Disposal was to the right side around the end of the chart, a rather long stretch.

The charts were remounted on two-inch blocks, which were fastened to the table top. This permits positioning the charts parallel to the front edge of the table and allows the finished orders to be disposed of to the front under the charts with a wrist motion.

Each regular pricer used about ten rubber stamps. These were allowed to lay on the desk in an inefficient disarray, resulting in frequent delays searching for the proper stamp. The desks and the girls hands were stained with ink.

A combination stamp holder and ink pad was developed that keeps the stamp in position for grasping on top of the ink pad in standard locations. It is only necessary to remove the stamp from the holder, make the impression on the ticket and return the stamp to the rack.

A stamp survey eliminated about twelve that were obsolete and disclosed the possibilities of combinations. One re-worded stamp resulted in the elimination of eight others.

Five types of shipping labels and four different flags were used and were kept in a wooden holder on top of the desk.

The number of labels were reduced from five to one for the regular pricers through the adoption of a combination parcel post and freight label and by routing Personalized Service, C.O.D., Express and Truck orders, requiring special labels, to certain girls. The label rack is no longer required. The combination labels are allowed to lay on the desk facilitating the grasp.

The flags indicated orders that required an irregular handling by special pricers. Three of these were eliminated.

Instead of attaching flags to the irregularities, the ticket to be handled is folded in such a way that one corner protrudes above the other tickets. Instead of unpinning a flag when it has served its purpose, as in the old method, it is only necessary to fold the ticket back to its original position.

Pins were kept in bowls making them difficult to grasp. They now lay on the desk adjacent to the labels. This makes it possible to grasp a pin and a label and position for pinning, with one hand and with one transport element.

Two changes in the method of pinning up the orders in departments preceding the pricing activity in the ticket office eliminated re-pinning by the pricers.

The pricers formerly checked each item priced with a pencil check and also applied their identification number to the ticket. The purpose of the checking was to indicate that the ticket had been priced. The checking was eliminated because the identification stamp is sufficient.

On single orders the total value of the order was entered at the bottom of the price column as well as on the top of the order where there is a space for the total of the order, to facilitate sales listing. Inasmuch as it is natural to total from bottom to top, the total is now entered at the top of the order only.

Formerly all tickets for dresses to be shipped from our New York Style Center required a wavy stamp impression after they were priced. This wavy stamp was a bar stamp two and one-half times as long as the regular stamp, and was too big for the stamp rack.

Now all New York orders are typed on tickets on which the wavy lines are already printed.

All single orders written on the customer's stationery were re-entered on a statement by the pricer for the purpose of condensing the necessary information.

These orders are no longer re-entered when all the necessary information is contained in not more than two lines, providing the order is legible.

When searching for the catalog number on the chart the pricers were in the habit of turning the leaves as though they were glancing through a magazine.

By watching the more skillful girls work it was noticed that they would jab their finger between the leaves of the chart at approximately the correct location, and strange as it may seem, they usually hit within one or two pages of the one desired.

All the girls are being taught to use this method.

It was also noticed as each ticket was finished the pricers would fold it back very neatly and carefully crease it.

They were instructed to allow the finished ticket to rest against the back of the left hand which is always in position to turn the next sheet. This method permits the tickets to fly back to their normal flat position as soon as the order is finished, whereas they required a definite refolding element when they were creased.

Methods work or job analysis on this activity resulted in twenty-two changes in pricing procedure.

A group of eight pricers are receiving special training in the new procedure with excellent results.

Their average before training was 178 tickets per hour. Their present average after five weeks is 212. This is an increase of about 19 per cent.

These two installations are of the clerical type.

The next installation to be covered is in the Shoe Department.

The mail orders are filled from open stock fixtures, consisting of long rows of bins in which the shoes are stored, in numerical sequence. As the stock in these bins becomes depleted, it is re-stocked by bin loaders, whose duty it is to open the cases of shoes and load them into the bins, after they have been brought in from the receiving room or the warehouse located some distance from the open stock. The shoes are transported to the open stock on large trucks holding about thirty cases.

Analysis of the job revealed the following procedure:

The large truck was positioned by the bin loader in some favorite location, seldom the best position from the standpoint of travel time.

He would then transfer the cases from the large truck to the small one and transport them to the proper bin—one case at a time. Arriving at the bin, he opened the case and proceeded to load the bin by removing the shoe boxes individually from the case with the right hand and passing them to the left hand to position in the bin. When the case was empty, he would return to the large truck and repeat the cycle, often returning to the same bin or others close to it several times.

Job analysis resulted in the adoption of a set of standard practice instructions.

1. The large truck was located as close as possible to the bins to be loaded.

2. By extending the length of the small truck about 16″ and double piling the cases crosswise, it was possible to transport six cases instead of one. Consequently, travel time was reduced considerably.

3. Instead of transferring the cases to the small truck

at random, the bin loader now selects all the cases for one location, eliminating backtracking.

4. When loading the bins the first two boxes in the case are extracted by grasping under the edge of the lid and are placed in the bin.

5. The balance of the shoes may be removed and placed in the bin five at a time.

These five simple changes, together with the incentive, resulted in a startling increase in outputs, as the following comparison will reveal:

BEFORE STUDY *(Actual Outputs)*		*100% Studied*
Women, Misses, Children	305	1025—3.36 times as many
Men	329	710—2.16 " " "
Boots	152	284—1.87 " " "
Rubbers	244	912—3.72 " " "

The average effectiveness of this division from January 2nd to the present time is about 102 per cent.

The next installation is presented, not with the idea of singing the praises of motion study, because it is really very elemental, but rather to portray the widespread possibilities of this invaluable tool of management.

While studying the engraving activity in our jewelry department, an obviously poor motion sequence used by the engraver was detected.

Following are the unnecessary handlings resulting in many useless motions. Each one was eliminated by rearranging the workplace and instructing the engraver in the use of a more economical motion sequence. In the interest of simplicity, only the motions eliminated are described:

1. Boxes containing silverware were carried from a window in the jewelry cage to a table nearby, requiring several steps to reach, and located to the rear of the engraver's normal working position.

2. The felt covers in which the silver is enclosed, after being removed were put in the boxes and the lids were replaced.

3. The knives, forks, spoons, etc., were piled on the "unwrapping table" temporarily, by type.

4. After the set was unwrapped each pile was transported to the work table.

5. It was necessary to open and close a drawer in the work bench to get an envelope containing transfer initials (these are patterns or dies of paper used to imprint on the piece to be engraved, the correct initial in the desired design).

6. Opened the envelope and dumped the contents on the work bench.

7. Searched for a certain initial.

8. Replaced the initials not wanted.

9. Opened the drawer, replaced envelope and closed drawer.

10. Made a full body turn to the left rear to get powder and tallow for laying out the work.

11. Transported finished work to table where the boxes had been left.

12. Removed the lids from the boxes.

13. Removed the felt bags.

14. Walked to the window of the cage to dispose of the finished work.

The window through which the silverware came to the engraver was within reach as he sat at his workplace. By rearranging the workplace, it was possible to get the work ahead without walking. Space was provided to place the boxes adjacent to the bench. As the silver was removed from the boxes it was positioned for laying out right on the bench. The transfer initials were put in separate little pasteboard jewelry boxes, glued to a piece of cardboard and located on a shelf at the rear of the bench. This facilitated the selection of the desired initial without searching through twenty-six pieces. The powder and tallow were located at the rear of the bench within easy reach. The finished work was put in the boxes right at the work place and disposed of without walking.

Now it may seem as if the pressure of schedule and the predetermined channels of flow established by belts and chutes would limit the possibilities of changing handlings and procedures sufficiently to produce any marked increase in output.

This is true to some extent but I think you will agree that the foregoing examples are ample evidence of the fact that even the most carefully planned and developed handlings, when subjected to the close scrutiny of motion analysis are susceptible to improvements that will yield gratifying profits.

MOTION STUDY IN THE FACTORY

By WILLIAM R. MULLEE
American Hard Rubber Company, Butler, N. J.

It seems to me that the big problem facing the motion-study engineer in the factory is not how to apply motion study but how to sell it.

Of course, if a company engages a consultant with a pleasing personality, the task of selling is simplified.

However, in the majority of cases men in the factory will be asked by management to do the job themselves. That is exactly what we had to do and that's why I think our experience will be of interest.

I often hear production men say, "My problem is different. We have too much variety." Let me point out therefore that our Butler Factory makes over thirty thousand different articles in addition to our standard mass-production items.

The objection is frequently raised that, "Some of our foremen are too old to go back to school. You can't teach an old dog new tricks." Again let me say that we had that problem. Many of our foremen have been with us twenty years or more. Some started at the bench as young men and grew up with the job. I have particularly in mind our Chief Inspector, who has more motion-study jobs to his credit than any of the young fellows. His service record is thirty-seven years.

Like a good many others, we first thought motion study had to be a laboratory job. As our first project we worked on a display-card assembly for one of our hard-rubber combs, a mass-production item. We spent a week making a micro-motion study, analyzing each therblig and building the simo-chart for a new method, and fixtures for a new workplace. Then I called in the foreman of the Packing Department and started to explain. "Oh, no," he said, "we can't do that." I was ready for that kind of talk so I asked, "Why not?" And his reply was, "Because the Advertising Department just changed the design." All my work scrapped because a new design meant a new arrangement of the motions and maybe a new workplace. This convinced me that if motion study was to succeed at our company it must be a factory tool, not a laboratory tool.

What do I mean by a factory tool? I mean that the factory must be able to apply motion study today and not have to wait for a micro-motion study tomorrow. Tomorrow is usually too late. Also, to be a factory tool, it must be simple to use, must not require too much paraphernalia, and best of all, the foreman should enjoy using it. Now, a foreman seldom enjoys using a new method handed to him from above, especially if no one asked his opinion. The same applies to the operator. But when the foreman or the operator suggests the new method he takes a personal interest in it. And he will not let his new method fail.

The first step in selling this new tool was to call a general meeting, to which we invited foremen, truckers, operators, in fact, everyone in the plant. They listened that night to an outside speaker, well known in the field of motion study. For three hours this man talked of what he had seen in other factories illustrating his talk by several motion pictures. His listeners saw how easy it was to change old methods into new methods after the rules of the game were mastered. This talk planted the seed, and then we were ready to organize our classes. Two men in our Standards Department had taken the motion study course at New York University and were well equipped to do the job. This point is important. If no one in a plant has had this training, then I would advise that an outside consultant be engaged, at least for the preliminary classes.

I believe our method of conducting motion study work at the plant will be of interest. Here is a typical twelve-session program:

1. Process chart on use of fountain pen or shaving. Illustrate on blackboard. Elementary symbols.

2. Each prepare a simple process chart for an operation in his own department prior to class. Discuss in class. Suggest new method.

3. Rules of motion economy. Normal working area. Five classes of motion.

4. Film analysis—suggestions from group. Photos to illustrate work done by other groups.

5. Bring in a simple job for discussion or use films for discussion.

6 to 11. Field work in groups of four men each. Select simple jobs involving hand motions. Make analysis with R.H. and L.H. charts. Plan new method. Discuss possible savings. Prepare sketches of new layout. Try out new method in cardboard or sheet metal. Have machinist make up permanent fixture. Each group completes two projects.

12. Combine all groups for final class meeting to review work of all independent groups.

End of session work them into their own departments.

Here are a few items that should be considered: We felt that if a man was interested in personal advancement, he would be willing to take this course on his own time. We decided to have a one hour meeting, once a week, right after quitting time. The courses were voluntary, and no one was particularly urged to attend, but we never had trouble in filling a class.

We grouped the men by occupation, i. e., foremen, tool designers, inspectors, etc., with a maximum of twenty men per class. So far we have not extended this to operators. We use the book "Common Sense Applied to Motion Study" as text and a copy is loaned to each member of the class.

Photos are taken of motion study applications and these are mounted on cardboard with a list of principles involved. This method has two good points:

1. It explains a problem in pictures in a way that everyone can understand.

2. It is gratifying to anyone to have his achievements photographed and his name mentioned.

Another point is to let the men in the class talk. Plan the session carefully so that they get up on their feet and explain what they have done or what they think about the various subjects brought up.

Foremen are usually poor at taking notes. Also, it makes it appear too much like going back to school. We, therefore, issue minutes of each meeting, which the men file in their note books. These minutes briefly summarize and drive home the important points covered.

For psychological reasons, it is usually better to conduct the field work in someone else's department. We found that a man can see how to change every department but his own in the beginning. Later on, he finds new ways for his own department.

For field work, pick jobs which involve hand motions, particularly ones where you feel there will be a saving at the end of the road. If, after a lot of motion study, a group can't show a saving they might lose some of their enthusiasm.

Another point about field work is that the group should not be too large. We found a group of four or five worked out best. If the groups are larger, there is too much irrelevant discussion and too little action. Assuming the class will break up into, say, four groups, we usually have one of our Standards Department men work with each group. In this way, they get the most out of the one-hour field session.

We found motion-picture films very useful for training motion mindedness. It is interesting to note how each class will pick apart jobs apparently perfected by other classes, when shown on the screen.

I would like to mention at this time a unique suggestion system which is working hand in hand with our motion-study work. Each foreman and many group leaders have small note books for recording suggestions. These books are picked up once per month. There are about forty-five note books in the plant at the present time. The Superintendent personally reads each suggestion recorded in the note books. He personally writes his comments or thanks in the book and then refers each project to several department heads in a short memorandum. A blind copy goes to the person making the suggestion so that he knows his idea has received proper consideration. Within a week's time, reports will come back from the department heads, giving their opinions of the suggestion. The suggestor is then advised of final action. In very few cases is there any cash reward. We prefer to reward in other ways, because cash awards invariably cause jealousy and dissatisfaction. We may, for example, paint the man's name on a special truck he has suggested. Very rarely is this truck left out in the rain. We may paint a man's name on some building change, doorway, etc., all of which provides a more permanent satisfaction.

As I mentioned in the beginning of my talk, we are not using the motion-picture camera for purpose of measurement. This is due to the great variety of our products, which prohibits spending too much time studying any one article. For the purpose of measurement, we are using tables of standard data. These tables are broken down into therblig combinations like, pick up, place in jig, raise spindle, etc. We have found it possible to use these elements of standard data in predicting time values for the new method, instead of using the micro-motion camera for this measurement. The camera would give us a break down of each therblig. For example, pick up would include, transport empty, grasp, and transport loaded, but our element of pick up does the job in less time.

During the beginning of our motion-study work, our Vice-President happened to walk through one of our Packing Departments in the late afternoon and commented on the slow motion of some of the girls. We were making a wage payment installation at that time and his observations checked with that of our time study men. They couldn't get a decent time study in the late afternoon. Obviously something was wrong. A fatigue study revealed that the workplace was entirely too low for proper working conditions. From the nature of the work, it became evident that the so-called "sitting and standing," arrangement would be desirable. The tables were raised to a height of 35 inches and at the same time, the chairs were reconstructed. We purchased a number of saddle-type seats and arranged suitable back rests and foot rests. The reduction in fatigue was evident and, after a few weeks, the girls' earnings began to climb. It would be impossible to induce the girls in this department to go back to the old working arrangement. Later on, this same type of chair seat was introduced into other departments, particularly Inspection Departments.

One important point to remember is that all changes must be made gradually. In many cases, they conflict

with individual opinions and it is poor policy to force a new arrangement on anyone who is not convinced. Those who try the new seating arrangement never go back to the old, and gradually, conservative ones are induced to try out the new idea. A study made by Western Electric Company a few years ago, which many of you may remember, clearly indicated that personal opinions about seating and workplace must be respected. The new idea must first be sold to the individual, otherwise, you cannot obtain the proper result.

In studying the question of fatigue, one motion-study class of inspectors decided to experiment with colored backgrounds against which to inspect. It was found that a black hard rubber comb could be inspected with less fatigue against a pale blue background. This checks with results obtained in a factory making women's black hosiery, especially the very fine weaves. Both pale blue and pale green are good colors to use.

After becoming motion minded, the foremen in our production machine shop began to notice that many standard machines, like grinders, lathes, etc., were not designed for good motion practice. They added a foot pedal here, an extension lever there. In some cases, they cut small lathes in half so the operator could use both hands at the end instead of using his right hand only at one side of the machine. Holes were cut into drill press tables for drop delivery, and metal chutes were attached to other machines. For fragile articles, a cloth drop delivery chute was developed. Racks were welded on the sides of machines to hold tote pans close to point of use. Wash troughs were built on the ends of centerless grinders to save a separate handling in and out of tank. They found a turret lathe only two years old required six inches of waste motion for each cycle. Imagine this waste repeated two thousand times a day, two hundred and fifty days per year. The machine cost $1,500.00. The change cost $5.00.

You all remember the story of how the late Frank Gilbreth sold the idea of motion study to a plant executive by unrolling many yards of wall paper on which he had drawn a process chart showing how the work traveled through the plant. The prospective client was so astonished at what he saw on the chart that he realized the necessity for a change. Likewise, our foremen found they could sell ideas with a process chart that they were never able to express dramatically enough in words.

Motion-study classes gave our foremen a new viewpoint on the work in the Standards Department and tied us closer together. We of the Standards Department have been fully repaid for our efforts by this one point alone, since it makes our work of searching for the "one best way" more pleasant and divides the burden over many instead of just a few. Every foreman becomes an unofficial member of the Standards Department. There is no question whether the average foreman is smart enough to do this job. The question is are you smart enough to sell it.

THE APPLICATION OF MOTION STUDY PRINCIPLES TO INSPECTION WORK

By WILLIAM A. HUTCHISON
Sharples Specialty Co., Philadelphia

I will attempt to describe how we applied Motion Study Principles to our inspection work in The Sharples Specialty Co.

A few years ago we had the pleasure of listening to Allan Mogensen tell of the applications of motion study in industry. We went back to our factory and began to look around for places where we could apply motion study principles. Since most of our work was long-cycle operations, with very few bench operations, we were able to find few places to apply it readily to our production work. It was necessary to look elsewhere for applications.

After a brief examination, the inspection work looked like the logical place to start, because approximately 90 per cent of our inspection work was short-cycle bench operations, with reasonable quantities, and comparatively simple operations.

Most of the operations were covered by the following five elements:

1. Check inside diameters with go and no-go plug gauges.
2. Check outside diameters with micrometers or go and no-go snap gauges.
3. Check lengths and thicknesses with micrometers or scales.
4. Check threads with thread gauges.
5. Check appearance by visual inspection.

We chose several of our highest production parts and studied the over-all inspection requirements. We considered the use of the parts in our assembly, making notes of the most important dimensions, and giving careful consideration to the possibilities of sampling or partial inspection of unimportant dimensions.

Next we made a process chart of the old or present method. We were immediately impressed by the fact that the left hand was used mainly for holding the part.

This immediately suggested the possibility of placing the tools or gauges on the bench, so that both hands would be free for inspection work. An examination of the tools or gauging equipment made it evident that we could remove the go and no-go plug gauges from their handle, cut them in half and fasten them to the bench. We had sufficient go and no-go snap gauges, of such a design, that could be fastened to the bench. Most of our threads are short, so we were able to remove them from the handle and also to cut them in half. Since it would not be convenient to check threaded parts, if the gauges were placed flat on the table, it seemed advisable to mount them on opposite sides of a bar of steel mounted vertically on the bench.

This procedure left us only the thickness and length gauges to provide for. After some study it seemed logical to make simple go and no-go step gauges which could be mounted face downward on the bench.

All of this procedure made it evident that we must provide a flexible method of mounting gauges on the benchs in order that we might keep all of our motions within the lowest possible classification. After considerable study we decided to make cast iron plates 12″ wide by 36″ long which could be mounted flush with the top of the bench and to drill and tap holes on 1″ centers over the entire surface of the plates. These plates gave us a smooth accurate surface plate, and permitted us to mount the gauges at any point on 1″ centers over the entire top surface of the plate. These plates were so positioned in the table to permit all operations to come within the three lowest classifications of motions, and most of them could be kept within the lower two classifications.

Our next consideration was given to the method of holding the supply of parts, and the possible use of drop delivery in the disposal of the parts after inspection. Several types of conventional designs of feed hoppers were used. We have not developed a satisfactory drop delivery chute, due to possible danger of damaging the parts, but I am sure that by the use of such types as were suggested by one of our previous speakers, we can provide satisfactory drop delivery chutes.

Next our attention was directed to the arrangement of the inspection tables, so as to provide ample light, with the minimum amount of eye strain for visual inspection.

We were using long tables facing the windows, which provided good light on clear days, but also caused the maximum amount of eye strain. We decided to use short benches, located at right angles to the windows, with low intensity mercury vapor lamps mounted at the extreme end of the benches with the reflectors arranged to throw the light to the center of the benches. This arrangement removed the glare of the windows, provided a balance of light for dark days and provided ample light for visual inspection.

Now having given careful consideration to the physical factors, we were ready to study new methods of inspection.

The gauges were arranged on the plate to provide two-handed operation, taking advantage of the principles of the hands moving in opposite directions at the same time, in a circular cycle of movement and in rhythm with each other. We were able to use a sliding motion of the part, making it necessary to lift the part from the table the minimum number of times. In the case of threaded parts, the inspectors soon became quite adept to screwing the parts into the gauges with both right and left hands. In some cases we found it desireable to make simple combination gauges, making use of the principle of mounting the part on a swinging arm and passing it under go and no-go pin gauges, or in some cases flush pin gauges. In this type of gauge we were also able to take advantage of go and no-go profile gauges for the measurement of lengths. In one gauge we were able to inspect in one pass, one outside diameter, one recess diameter, one length dimension, and one width and location of a recess.

In other cases where the parts were long and required both hands for the gauging of one part, we arranged the gauges on the plate in the best sequence and passed the part through the various gauges holding it with both hands.

After having decided upon the proper procedure for the operation, a second process chart, showing the improved method, was made up and if the work was properly balanced between the two hands and if all the unnecessary operations had been eliminated, we adopted the procedure and recorded the set-up on the instruction sheet. This instruction sheet is arranged so that the exact set-up can be shown and the details of the operation recorded making it possible to duplicate quickly the new procedure at any time.

Some months ago in the Motion Study Section of the Philadelphia Chapter we demonstrated and photographed the old and new method of inspecting a metal bushing. We found that the old method required .223 minutes for one piece while the new method requires

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A Review of Scientific Management

By WALTER D. FULLER
President, Curtis Publishing Company

SUMMARY

The practice of the principles of scientific management not only saves money but improves quality of product and betters employer-employe relations. It gives more opportunity for individual development. As its contribution to society, scientific management helps raise the general standard of living through reduction of prices.

ALMOST thirty years ago, certain of the younger executives at the Curtis Publishing Company became conscious of a new doctrine known as "Scientific Management" which was being discussed in our Philadelphia area. Mr. Frederick W. Taylor had written various articles on the subject and either had written or was soon to write his famous books.

I happened to be one of these younger executives, and because of the highly competitive nature of the magazine business, we were all faced with the necessity of increasing production and reducing unit costs by any practical means that could be found. So just about thirty years ago we started the early beginning of analytical management with our company both in office and factory.

Much water has gone over the dam since those days. We have discovered that there is far more to science in management than merely the saving of money. We have found that the practice of these principles improves quality, creates better personnel, greater loyalty, more intelligent co-operation, deeper interest, and generally a more loyal and effective organization. It automatically eliminates the drones and gives genuine opportunity to every worker who wants to work and is trying to progress.

The methods which we have used at the Curtis Publishing Company over these many years are pretty generally known to all of you. They have been written up in the magazines and they have been touched upon in various books on the subject.

When scientific management was started at the Curtis Company, it was definitely on the defensive and in those early years we had our troubles in gaining permission to try the perfectly logical things we wished to try. Of course, those years are a long way behind us and analytical, scientific methods are accepted as an absolute necessity in most competitive business today.

The results of this work have been to save our company millions of dollars over the intervening years. They have been instrumental in the development of new processes and new machinery which have not only saved us further millions, but which have broadened and developed the field of the whole printing industry. These things might have happened without scientific analysis, but I doubt it. Beyond these advantages, the honest and fair development of these methods has built up an enthusiastic personnel which is one of the principal reasons for the premier position of the Curtis Company in the magazine publishing world today.

It seems to me difficult to segregate scientific management into any particular pigeon hole unless you are merely going to talk technical details. Analytical management is just as necessary whether it applies to the office, to the factory, or to the sales force and our experience shows that, except for matters of detail, the same reasoning and the same general methods can be applied in each of these branches of industry. The whole thing, of course, is simple enough and consists largely of the rule that we shall not act on impulse, hunch, or so-called business judgment, which unfortunately is often merely another name for prejudice, but that instead we shall be certain of our facts and then argue from the known fact to the obvious conclusion and with this material, tempered by experience and common sense, we shall proceed with our particular activity. Into this picture we also need to inject the necessary checks and balances just as we need checks and balances in national government so that the pendulum cannot swing too far too rapidly in any direction. This is trying to the desires of an impatient executive just as checks are at times trying to an impatient majority in political life. Certainly true science in management will always realize the importance of not acting too rapidly.

I should like to elaborate a little on the accomplishments of scientific management, whether it be in the

office, in the factory, or in the field of sales. Let us consider first the individual. What does it do for him? In the first place, it gives him opportunity—it gives to those who have ability and are willing to use it, the power to stand out above the crowd and to have the real appreciation for what they are doing. How often all of us have seen the able workman who perhaps did not happen to be a particularly good politician, subordinated to another man of far less ability, but who was a good mixer or who happened to have the liking of his boss. Such things are not possible in a plant well operated under the principles of scientific management. The opportunity to the individual is far greater under scientific management than without it. Certainly any intelligent person with the right objectives is only too anxious that his chiefs should know what good work he is doing.

We have found it generally true that the willing but inefficient person can with proper training be made efficient in some field and very frequently we have found that such persons after proper training have resulted in workers of a determined, plugging nature who in many ways were more desirable employes than were other more brilliant and less persistent individuals. That is one of the quarrels which I have with so-called psychological tests in business. Such tests will show up the brilliant, smart-aleck type, but they rarely give proper weight to the other needs of industrial life, that is, persistence, loyalty and other similar factors which with most of us are more important than merely brilliance and quickness.

For the drone, that is the lazy, inefficient individual who doesn't want to work, I am sure that scientific management offers very little future. But many persons regarded as drones do not really belong in that classification and with proper analysis of their weak points and with proper encouragement and good training, such people can very often be turned into desirable workers.

Let us consider next what scientific management does for the employer. It reduces expenses materially. It gives to workers enthusiasm and loyalty. It stimulates inventions and it increases sales. Fundamentally, it increases profits. These are the results if the employer is honest. Too many scientific management plans in the past have been wrecked because the employer did not live up to his promises or did not retain the confidence of his workers, but that was not the fault of the method. Such troubles are frequently not intentional. Statements are made by subordinates that are unauthorized, errors in bonus payments start all kinds of personnel trouble, and changes in plans are sometimes made without proper consideration. Whatever the reason may be, it is a certainty that complete honesty and frankness on the part of the employer is fundamental to the success of any scientific management plan.

Lastly, what is the value to society of scientific management? May I quote from a public statement recently made by our company. In this we point out that "people go up in this country in proportion as things go down. The standard of living increases as the cost of the products of industry decrease and businesses grow greater as their prices grow smaller." This American concept, which was born perhaps thirty or forty years ago, represents something fundamentally new in human thinking. To repeat, the way to bigger businesses is through lower prices; people will go up and up in the economic scale if the cost of things keeps going down.

Probably scientific management, or science in management, or analysis in management, together with the principles I have just stated, have been the fundamental reasons for America's enormous development since 1900. No one can stop it nor can anyone for very long turn back or dam its progress. The whole world has learned from America and the whole world is moving along the same line. We shall continue to lead and many of you who are here tonight will see progress during the next thirty years that will make the past thirty years of scientific management seem small by comparison.

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.114 minutes for two pieces or a reduction in time of 76.5 per cent.

This particular part offered excellent opportunities for savings in time, but throughout our entire program we have never saved less than 30 per cent. All of our work to date has been done with the minimum amount of cash expenditure and has paid us enormous dividends and at the same time has made the work easier for the inspectors.

Time Study Section

WHAT MANAGEMENT EXPECTS FROM THE TIME STUDY DEPARTMENT

By JAMES M. TALBOT
Factory Manager, S. S. White Dental Manufacturing Co., Staten Island, New York

Time study is essentially a searching for facts. It, no doubt, had its origin in industry many years ago, but received great stimulus at the hands of Frederick W. Taylor and Frank Gilbreth, those great explorers in industrial processes. Regardless of what one may think of the right or wrong of its application to human endeavor, we cannot lose sight of the value of knowing all we can about the elements that go to make up any activity. The principle of inductive reasoning demands the knowledge of all the elements no matter what the subject of investigation may be.

As applied to industrial processes time study has for its purposes:

1. The determination of the immediate best way of doing a task and the proper elapsed time for doing it in this way (I use the word "immediate" advisably—there is no one "best way"—only a *better* way).
2. The securing of better and more accurate control of planning.
3. The setting up of a basis for fair and adequate wage rates.

There is no limit to the extent to which this work can be carried. It may be done in a desultory manner or it may be done with the most exacting types of measuring instruments, stop watches, motion pictures, three dimensional recording, psychological studies in time reactions, environmental influences and what not. Human beings are analyzed and psychoanalyzed; machines are X-rayed and spectographed. Every conceivable type of test is applied to squeeze out the last element of inefficiency.

It is obvious that there is a certain limit to which industry can go. There are too many operations, too many changes continually being introduced, and too many other influences at work to make it possible or even desirable to resort to such a searching analysis. In fact, there is a tendency to get away from the practice of studying complete operations by the substitution of so-called "standard data." Machine cutting times, setting up operations, etc., are found by study, and synthetic standards for the performances of work are obtained which serve as well as individual time studies. This has been carried to the point where human motions have been analyzed and evaluated and standards set by merely recording the sequence of operations and setting down the time elements of each motion.

To revert to the three purposes above described, it may be well to amplify them. Regarding the first purpose of determining the best way of doing a task, the following elements must be considered: (a) the time of doing the work, (b) the materials used, (c) the quality desired, (d) the equipment used, and (e) the workmen.

True time study does not merely concern itself with the time employed, which may prove ultimately to be the smallest factor. Material may be so much a part of the total cost that the conservation of this is paramount. Unusual quality requirements again may impose limitation upon the types of operators. The study of the proper equipment to use and its relations to the operations will accomplish remarkable results; and finally the type of operator, the posture provided for him, the arrangement of his work and even his environment will affect the performance.

Data compiled by the time-study department, based upon the above information, in cases where a large part of the product has been studied, affords an excellent method of controlling production. At first sight it may seem that there is a rather remote connection between the two. However, from the studies made, standards of performances are set, and it becomes possible to determine the number of minutes or units or any other name they may be called by, that go to make up the total. These units become common denominators which may be applied to a study of total departments, to production, to a separation of various articles of manufacture, to orders, shipments, number of operators required, or to any one of many more types of information. It is surprising the number of uses to which this most flexible tool can be put.

In the third purpose of time study, we come to the most important function—as a basis for setting fair and adequate wage rates. No matter what vehicle may be used to convert this information into the contents of the pay envelope (and there are numerous ways) the soundness of the original study and the spirit actuating the conversion are vital factors affecting our

industrial life. The whole question of incentives is intimately connected with this process and we all know how important this question has come to be. Intelligently applied time study can be used to interest the worker and his foreman. In no better way can methods be changed and the co-operation of the working force secured. Under such circumstances no one can deny the importance of time study and the advisability of giving it very careful attention.

What are the qualifications required of a department that can fulfill such an important function. We have time only to record them here without much amplification:

1. There is nothing mysterious about time-study work, nor anything that should be kept secret.

2. Proper personnel is the most important qualification. Time-study men must have confidence in what they are doing. There dare be no doubt in a time-study man's mind as to his standing. Unless he thoroughly believes that what he is doing benefits both the management and the man, he should not be permitted to do this work. There must be enthusiasm because the work is largely discouraging during the period of application.

3. The men should be of the type that refrain from criticizing operators, their work or their methods.

4. The more knowledge they have of the types of work they are studying, the better. Knowledge of machines, tools, manufacturing processes, specifications and so forth is of great importance.

5. Leadership is essential to sell both the management and employes. Initiative is most important because a time-study department is pioneering. Time-study men must be able to stand severe criticism.

6. There must be an aptitude for digging out facts and analyzing situations. Judgment is an important qualification in a time-study man because much of this must be used in the mechanics of building up a time study and also in dealing with the human side of the situation.

7. The department must be honest in the making of all contracts. It is of extreme importance that time-study men win and retain the good will and complete confidence of the workers and foremen.

8. By enlisting the enthusiasm and co-operation of the workmen and foremen much may be accomplished.

Finally, and as a word of caution, let it be remembered that time study is a means to an end, not an end in itself. Standards obtained from such a study are standard only so long as the method is continued and of course under no conditions should they be changed until the method is changed. But there should be incessant research to find new and better methods for which once again the time study will be called upon to establish new standards, and so on indefinitely.

IS BONUS NECESSARY?

By C. A. McCLUNG
Manager, Cost Control Division, R. C. A. Victor Manufacturing Co., Philadelphia

First, let us consider "What is bonus?" A bonus is an additional amount paid over and above a pre-arranged stipulated amount. By that I mean, that it is general practice for industry today to hire employes at a given rate per hour for certain classifications of labor. There are various methods of payment whereby the employe, by his production, can increase his hourly earning beyond the previously arranged basic rate. The difference between the total hourly earnings and this basic rate is commonly known as bonus, premium or piece-work earnings. It has been my experience, however, that after an employe has been operating on any one of these methods of wage payment for any length of time, he considers as his hourly rate the amount of his entire pay pro-rated over the number of hours he works with absolute disregard for the pre-arranged basic hourly rate. To paint this picture more clearly, let us assume that a man is hired at a basic rate of $.50 per hour and when he goes to work on a production job, the piece rate, bonus rate or premium rate is set so that he can average $.75 per hour on the job. After he has earned this rate per hour for any length of time, the $.50 per hour basic rate is entirely forgotten and he considers his hourly rate the rate which he actually earns. Shall we agree then that insofar as the individual operator is concerned there is no such thing as bonus since he receives a certain amount of money for a definite amount of work.

The next question to be considered is the necessity of a bonus. There can be widely divergent opinions as to the necessity of a bonus or a premium or as to whether there is any necessity whatever. Let us consider some of the more commonly recognized necessities.

Bonus or premium systems were originally designed to increase production and to compensate the operator for the extended energy required to accomplish that increase. One of the greatest necessities today for a bonus or premium system of payment is to induce the operator to extend his energies and produce a greater

quantity. This requirement, in my opinion, is caused by a lack of competent supervision. Let us understand at this point that I do not advocate a change to a strictly hourly rate at the equivalent of the hiring base rate regardless of what the earnings on a bonus or premium system may have been. It is my contention that the hourly rates should be reviewed and careful consideration given to what the total earnings of the operator would be on a recognized bonus plan and his basic hourly rate established accordingly. The question will then arise as to the incentive for the operator to continue to average that production or to increase it. We consider this problem in the following manner: Fundamentally, we believe that a larger percentage of the persons who sell their labor start out with the idea in mind of fair dealing and will generally turn in a fair day's work for a fair day's compensation. I can see no difference between a man hired at $.50 an hour and working on a bonus system with a total average earning of $.75 per hour, and a man on a day work system with a flat day rate of $.75 an hour. Is it not reasonable to expect that this person will turn out the same amount of work on a day work basis as he would on the bonus method? His incentive will consist of holding his present rate or promotion to a higher rate through efficient workmanship rather than having a job at a low base rate with an incentive to produce more in quantity in order to increase his earnings.

In our plant, we delegate as the responsibility of a foreman the meeting of his schedules with a quality production, on time, and at a reasonable cost. In other words, we are striving to have our productive departments become "man managed" instead of a foreman being a figure head carrying out a prescribed routine covered by a complex "paper" system. Meeting schedules on time means quantity. However, *quantity* and *quality* must go hand in hand. It is the duty of the foreman to see that the quantity required is produced but not at the expense of quality. Too often, cases come to light where the reverse is true. The final result is an increase in cost through damaged product causing expensive repairs or in the total scrapping of the part. This must be overcome in a field as highly competitive as the one in which we are engaged. When a man is hired, he realizes that quality of work as well as quantity must be maintained. It seems reasonable to believe that he will work with this understanding and thereby keep rejects at a minimum. This attitude means that costs of product will be kept as low as possible. Inferior work will be reflected in his periodic review. It is not our intention to hamper this foreman by taking away from him information which a bonus or premium method of payment would give him in the form of piece rates, etc., which give him a yardstick as to the performance of the operators. We do not intend to stop taking time studies and setting rates of production which the foreman must expect from his operators and assure accomplishment. We take a time study and set up a standard rate of production on each of these hourly rated jobs and it is the production foreman's responsibility to delegate to his assistants the duty of seeing that these standards of performance are met. I do not doubt that some of you would be surprised if you knew in how many cases the standard of performance is beaten in this system of payment as compared to excessive earnings under a piece-rate or bonus method of payment.

Any wage-incentive plan is usually more costly to operate due to its inherent complexity of figures, for it must be carried out to minute details. This condition introduces a greater possibility of errors with resultant misunderstanding and difficulty of correction.

Contrasted to these conditions, the day-work method of wage payment offers many desirable features. Foremost among these is its simplicity of operation and understanding. An operator working on mutually acceptable hourly rate knows after a few simple computations exactly what his pay envelope will contain. There are no brainstorms, real or imposed, as a result of efforts to understand a wage-incentive plan. There are not so many misunderstandings between the operator and the time-study man when a standard rate of production is being established.

When the operator is hired at a given hourly rate, he understands that a definite amount of effort is expected of him. If he does not measure up to expectations, he knows that he is subject to rerating downward, or placement in a less responsible position with corresponding decrease in remuneration. This condition in itself will cause him to keep his output at a high level. If his wage is set at a point equivalent to an hourly rate plus a percentage as measured according to some incentive plan, his output will be just as great. A steady wage implies an expected and commensurate output.

The question of promotion can easily be handled by instituting a regular periodic review of the employe's job, salary and progress made during the interval of time just passed. This will encourage a feeling of responsibility and make him realize that his progress

is entirely contingent upon what he does in his present capacity. Sufficient incentive will be added in this manner to urge him to surpass past efforts and enjoy advancement and increased wages.

Finally, there is that important factor of proper mental attitude of the employes with relation to their work and to the management as a whole. A very definite psychological reaction presents itself when, through a complete understanding of the rate structure, they are satisfied that the company employing them is giving them a square deal. They are also appreciative of the company's interest in their welfare, not as a group of tools to be used purely as a matter of utility, but as human beings worthy of their hire and as definite factors in the social life of their community.

PULLING THE TEETH OF RATE REVISIONS

By DALE PURVES

Assistant Treasurer, John B. Stetson Company, Philadelphia

If the revision of rates is to be appropriately likened to pulling teeth, it logically follows that the process of revision is apt to be painful, unpleasant and solemn, no matter how beneficial the ultimate results. There are very few if any phases of industrial life which carry the deep significance of the basic pay rate as far as the industrial worker is concerned. It is not a problem which can be approached in a coldly scientific, academic manner, for pay rates are the primary tangible recognition which the worker receives for the contribution of his life to industry. In this compensation are involved questions of security, pride—in fact nearly everything by which one's value to the community might be measured.

In a constantly evolving industrial scene, basic pay structures are anything but static. It does not seem at all necessary to dwell here upon that self-evident evolution by which all managements find themselves constantly measured, and which requires them to change and improve for survival. Therefore, industrial evolution of necessity involves rate revision and imposes in this respect a problem to be met, not one to try to avoid.

From the worker's angle, rate revisions will probably always be regarded with mistrust and fear, because they are operations of evolution, and evolution is not generally kindly in its selections. No matter how scientific and well grounded the plan to revise rates (and we can consider only this type of revision here) it may be safely stated that the worker's attitude is more or less suspicious, skeptical or even hostile.

Let us assume a typical rate revision problem and follow it step by step, pulling teeth if we can. We might carry the dental analogy further and say that, in spite of past experience, this particular problem is just as likely as not to contain teeth different from any others before encountered, although the face may be commonplace.

In the course of industrial evolution our mythical management faces its economic labor problem. Upon competent and thorough investigation, it finds that the existing wage structure is, figuratively speaking, a patch-work quilt which has been many years in the making. Piece rates predominate, but there is a sprinkling of time work. Respecting the two fundamental factors of piece rate setting, to wit, the value of the type of work performed and the amount of time required for the operations, the piece-rate structure lacks internal uniformity, and bears an uncertain relation to the prevailing labor market. Some of the piece rates are whimsical, and all contain a concealed allowance for lost time.

A rate revision is formulated upon a sound scientific basis, and is presented to the management for approval. It is shown that the costs will be thereby substantially reduced, but that hourly earnings of labor will be increased. In support of the improved earning power, records of past earnings are offered from which it is evident that the former time workers will gain by the offer of production incentives, and the piece workers will gain because the considerable idle time formerly countenanced by management will be eliminated through various controls. Standardization of methods may account for other economies. The rate revision receives executive approval and is then presented to the workers as the new official schedule, effective as of the beginning of the next pay period.

The reaction of the worker to the revision is a disappointing surprise to management. The sound arguments about increased earning power have no effect whatever. To labor, these considerations unsupported by their experience, are abstruse, academic and fictitious. The time workers are, however, fairly receptive: After all they are not as yet production-minded, and their criterion is "cents per hour"—which falls into line with the revision. But the piece worker is a desperately different problem, and here appears the first and most difficult task for the tooth puller's skill. The piece worker's criterion is "cents per piece." If costs are

reduced under the revision, then the piece worker's criterion reveals a reduction, and that is all there is to be said. No matter how great the idle time abuse under the old piece rate, and the hourly possibilities under the new, the outstanding fact to the worker is the "cut" per piece and no amount of explanation can materially alter that impression. In the writer's experience, there appears to be no anesthetic for this tooth extraction. We can take a cue from the dental surgeon and admit that "this is going to hurt, but it is necessary and will be beneficial in the long run." Frankness and sincerity are better than concealment.

For the particular and not uncommon situation outlined above, there are several points to bear in mind which will perhaps enable management and labor to work out this joint problem successfully.

First, and almost superfluous, is the thought that the revision must be basically complete and equitable. Rate revisions aim at efficiency and economy, but it might not be possible to achieve economies in every operation covered and still be in strict and consistent accord with the plan. Yet the fundamental equity of the plan must be the major concern of the management, and should be applied to every operation alike. Management's position must be solid, clear and without reservations. The necessity for such a position in a matter of human relationship seems to be obvious.

Second, although management has conceived the rate revision soundly and thoroughly, it does not follow that the plan is absolutely water-tight. Perhaps certain labor aspects have been overlooked; perhaps standards have been established with a rigidity that at first appears unattainable to the worker. As an evidence of good faith, management should make clear its desire to investigate and correct errors or omissions in the set-up. Management must be prepared to listen to the worker's side, perhaps even to the extent of bargaining. The matter of bargaining is a difficult one to approach, and for that very reason, all the more important to recognize. Rate revisions can involve such sweeping changes from traditional ways that strikes are precipitated. Such an outcome is unpleasant momentarily for both labor and management, and emotion can run away from facts if allowed to. In such a crisis, management's greatest assets are its good faith, its good will and its open-mindedness. Strikes terminated on this basis should achieve a working relationship better than prevailed before the revision because of the inevitable increase in mutual understanding. But be it clearly understood that management's good faith and open-mindedness do not imply for a moment that management should allow itself to be bamboozled to achieve settlement, for that would be worse than no settlement at all.

Third, following the disposition to bargain comes the necessity for actually compromising and conceding. As an engineer, the writer is reluctant to advocate a course which suggests that in some cases it might be advisable to deviate from scientific findings. On the other hand, the scientific background for rate revisions is only moderately accurate: Men are not Newton's apples, tumbling with an acceleration of thirty-two feet per second. The equations upon which rate revisions are based are relative, not absolute, and it seems perfectly sound to admit that rate problems can be placed in more than one frame of reference with equal validity. In specific illustration, let us consider an unskilled job which under the old piece work rates has an earning possibility equal to the skilled labor market. The incumbent has enjoyed a skilled worker's earning capacity, and by that token, is a skilled worker from his point of view. The rate revision places the job in the proper earnings bracket respecting skill, and our friend the worker finds himself confronted with a serious cut which he sincerely is unable to understand. The company's right to produce an unskilled earning for an unskilled job cannot be questioned. But the company's obligation to the particular worker affected by the change cannot be dismissed overnight. After all, the skilled earning status was a creation of the company. In this case, may there not be a valid ground for compromise? It would seem fair that management devise a special temporary rate to apply to the individual which would recognize its obligation to him without altering the basic classification of the job in the new schedule.

In the paragraphs above we have considered in broad outlines a rate revision which made a radical break with the previous rates. It is well to consider that particularly painful type, because it is one which comes within the experience of almost every executive. After the new revision is established, there is one admonition deserving good heed, as follows: "Don't let it happen again." Or to continue the dental picture, one might say: "Be sure to have your rates gone over and polished every six months." In other words, the degree of trouble attending rate revisions is a measure of the neglect into which the rates have fallen. If rate changes do not keep pace with the changes in the operations to which they apply, it is only a matter of short time before the old rate is firmly embedded in the mind of workers as the equitable rate for the new operation. Industrial

evolution becomes understandable and acceptable when rate revisions are up to date—mainly, because industrial evolution is logical and moves with evolutionary, not revolutionary speed.

Rate revisions are rendered more acceptable when they can be accompanied by changes in the method or organization. After all, the condition which makes revisions so unacceptable is that a change in pay takes place without any corresponding change in the operation or operating conditions. It does not help management's position to justify such a revision on the grounds that it is only doing something which it should have done long ago.

In conclusion, let us review the ground covered in approaching the problem of pulling the teeth out of rate revisions. We have recognized that the problem is a painful one from its very title. We also recognize that it is an unavoidable problem imposed by industrial evolution. The general thesis of this paper is that management's first duty is to devise an equitable schedule of rates, based upon every available source of reliable information respecting the labor involved. Its second obligation is to evidence in its presentation of the plan to the worker, its good will and faith, its desire to work out the rate structure equitably and with an open mind. Its third obligation is to recognize the human aspects of the problem with which it is dealing, without losing sight of the objectives of the rate revision. And after all that is said, have we done other than to re-affirm the old truth that, *in this especially human industrial relationship, there is no substitute or disguise for competent, sincere management?*

A TIME STUDY YARD STICK

By GEORGE P. LECHLER
Industrial Engineer, Sears, Roebuck & Co., Philadelphia

There comes a time in the development of most business enterprises when a need is felt for the application of scientific-management methods to some of the more difficult problems facing the management of the business.

Because the executives engaged in the active management of the business are usually unable to devote the time necessary to analyze correctly and to solve these problems, it is found practical to establish a special man or group of men to handle this work; men who are analytical and who have been trained in the science of motion- and time-study work, and who can devote their undivided attention to this work.

The problems with which the management is confronted often have to do with effective and economical operation and the reduction of costs. Now the only ways to reduce labor costs, as far as I know, are (1) by paying lower wages for the effort expended, (2) by eliminating wasteful or unnecessary parts of the work which will give greater outputs with the same effort, or (3) by getting greater effort and therefore greater outputs from the employes. Obviously, the first method is the least desirable and is not to be considered unless all other means fail. The second plan is the most desirable and should be the first employed. When the wasteful methods have been eliminated, the third plan can be brought into play by the use of an incentive.

We will, for the purpose of identification, call this specialized group the methods division, although various other titles, such as production department or planning department might be equally applicable.

Let us assume a typical example:

The man in charge of this methods work is a bright fellow who directs his group in a practical manner. They pick out the weakest spots they can find, from observation or preliminary study, and go to work. The General Manager, being a practical man and a graduate of the school of hard knocks, watches with interest. Results are what he wants.

Even though he has the utmost confidence in the division, sooner or later there is likely to creep into the mind of the Manager or the Executive Staff, some doubt as to the actual value of the division. Some member of the staff or department manager may be prejudiced and impart the idea that the division is not functioning as it should. The General Manager may be out of contact with the division for some time, and returning, wonder whether the progress made is sufficient. The division may be overorganized. The man in charge of the divison may be a glib talker and cover lack of accomplishment with fine words. Conversely, good results may be overshadowed by poor presentation on the part of the division manager. In any of these cases, eventually the question arises, how good is our methods division? It is then up to the man in charge of the methods work to show just what his division is doing.

This, then, is the problem: How can the work of a methods division be satisfactorily appraised? What method of measurement can be employed which will evaluate the job being done, so that the management knows definitely the worth of the methods division?

The duties of a methods division may be specialized, dealing exclusively with one subject, such as time study

rate setting, or they may be quite diversified, covering the whole range of management problems, but, regardless of the range, the foundamental test of value is whether it produces enough saving to pay its way. Even a well-organized methods division is a costly procedure and should certainly have to justify its existence.

In Sears, Roebuck and Company, the functions of the methods division deal with improving working habits and conditions, easier and simpler procedure, the standardization of methods and instructions, the installation of wage incentives, which include both production and quality control, and methods of training new employes. I want to explain, at this point, that the work about which I speak is related entirely to the mail order branch of our business, which is carried on in our ten mail order stores throughout the country, with a central methods division in the parent organization in Chicago. Furthermore, I would like to say that methods work is in its infancy in this company, and is being expanded very slowly and carefully, to avoid the pitfalls of rapid expansion with which you are all familiar.

Before starting work in any department, the methods division makes a preliminary survey, and from past performance records and other available data sets up an estimate of savings. I will trace through the procedure in cases where it is intended to follow the improvement work with a bonus installation. A form entitled "Estimate of Savings from Method Study and Wage Incentive" is provided to assist the methods division in developing and following through a definite program of study. It is designed to:

1. Indicate unprofitable studies, so that they can be avoided.

2. Indicate most profitable studies for determining the order of work.

3. Provide a means of following up methods and incentive studies, both as to progress during study and results after study.

4. Provide a means of exchanging results between stores.

The figures used on this form are entered as follows:

The Proposed Starting Rate, which is set up in conjunction with the employment department from surveys of comparable labor, both inside and outside our store, and insofar as this estimate of saving is concerned is used only for obtaining the Paid for Effectiveness, which I will describe in just a moment.

The Present Average Rate, which is self-explanatory.

The Estimated Present Effectiveness, based on general observation and judgment, supplemented in some cases by brief analyses and tests.

The Paid for Effectiveness—This is the relationship between the Present Average Rate and an hour-value table, taken from the curve established for use in all bonus calculations, and showing the hourly rate paid at each per cent of effectiveness. In other words, it is the effectiveness corresponding on this table to the present average wage.

The Expected Effectiveness for the first Thirteen periods (our year being divided into thirteen periods of twenty-eight days each) is determined from a consideration of the contemplated changes in methods and procedures and the ability of the group to adapt itself to the changes. Likewise the pick-up in effort due to the bonus earnings will be a factor. The general experience in previous installations helps to develop these figures, which take the form of a curve, building up gradually and at a decreasing rate through the year. Allowance must be made for periods of heavy volume, in which the hiring of new employes will decrease the group effectiveness.

The difference between the Present Effectiveness and the Paid for Effectiveness is the increase necessary before the division will pay its way. This increase is then changed over to decreased cost. We have, for our convenience, set up tables of equivalents for changing percentage increases in outputs to percentage decreases in costs or the reverse.

The difference between the Paid for Effectiveness and the Expected Effectiveness average for the first year is the additional increase after the division pays its way. This is also expressed as a decrease in cost. This figure must be adjusted by the percentage of saving retained by the company in a bonus activity to get the payroll saving. In other words, as we are calculating the saving of the company, we include the total saving from pick-up in production up to the point where the group pays its way, and from that point on only that portion of the savings which is not passed on to the worker. By adding these two figures, we obtain a total estimate of payroll saving in terms of percentage. This figure is applied against the total annual direct payroll to show the estimated saving in dollars. A percentage of saving is likewise estimated for indirect payroll, such as supervision, and for supply and equipment expense and these are applied against the annual cost of each in a similar way, to get an estimated saving in terms of dollars. These are added to the direct payroll saving to get the estimated gross saving.

From this must be deducted the estimated cost of the improvements, which includes the estimated methods division payroll, the cost of additions or alterations to the supplies or equipment, and training costs, that is, loss in outputs due to new methods. The remainder is the estimated net saving and, divided by the estimated cost of the improvements, gives an estimated return on the expenditure. It is on the basis of this estimate that the work of the division is planned, and copies are sent to the General Manager and the parent methods division.

In order that there will be no misunderstanding, I wish to bring out the fact that these figures are to a degree arbitrary, but if they are set down with the thought and judgment which should be given them, they serve very well indeed the purposes for which they are designed, as stated previously.

For one year after each job is completed, at the close of each period, the methods division notates its progress on that job. The average cost per unit, total units handled, and error percentage are obtained each period from the department and thrown against the "before study" figures, which are averages of four or five periods' work, to get the actual saving.

The parent methods division and the General Manager keep copies of the estimate of saving on each installation for one year, and each period receive a report on the following points which are entered to the reverse side of this record: The increase in output over the "before study" figure, the decrease in errors, the payroll savings for the period and accumulatively, and the present percentage of effectiveness.

There is another period report sent to the parent methods division and the General Manager each period covering the current jobs, giving a brief review of the work of the period, the progress made and the plans for the coming period. Incidentally, a record of all bonus installations accompanies this, showing the number of people on bonus, the effectiveness, the number of substandard people and any reasons there may be for a substandard showing.

To summarize, we have an estimate of saving made before each job is started, a record of the actual saving made each period and cumulatively for one year and a period report of the work in progress, work completed or started and plans for work ahead.

No attempt is made to throw the actual cost of any installation against the savings. There was a time when this was done, but the clerical expense of keeping the time of the methods men separate by jobs, was felt to be unwarranted and was discontinued. Under the present plan, the General Manager or the parent methods division can check the results at any time by comparing the methods division payroll for any period with the actual period savings for all jobs.

It is admitted that this plan could have added advantages, such as bringing to the attention of the executives periodically the actual return on investment in the methods division, but this figure is available when needed and I might add that the return has, up to the present time, been so great that there has never been any question as to the value of the work. Furthermore, we feel that the clerical work of measuring the results has been kept to a reasonable minimum, not exceeding 2 per cent of the time of the division.

I further agree that this method reduces the measurement of the work to a cold matter of dollars and cents, but that is probably exactly what it should be. One might say that many of the attributes of a methods division are intangible, that there are many services rendered by this division which cannot be measured. It is true that many small jobs are called for which cannot be included in the figures, even though they are all included in the period report of results. In the final analysis, however, I repeat what I mentioned earlier, that this activity should have to justify its existence and its ability to pay its way is its best justification.

Unemployment Insurance, A Problem of Administration

by C. A. KULP

Professor of Insurance, University of Pennsylvania, Philadelphia

SUMMARY

The problem of administering unemployment insurance, now that such insurance has become an accepted method of alleviating the distresses of joblessness, resolves itself into three factors: a clearly stated and understood law, an administrative personnel of high calibre, especially at the top, and a co-operative attitude on the part of employers.

THE subject of these remarks today is significant. Five years ago the speaker on unemployment insurance had to explain the very expression itself. Three years ago, in an atmosphere at least skeptical, he had to be extremely careful not to turn apologist in an effort to get his subject a fair hearing. By 1936 we have come so far along as to slate a speaker for a discussion not of whether we shall have unemployment insurance, but of how.

I do not wish to overstate the difference that has taken place in American thinking in the last five or six years. I do not say that the people who are now for unemployment insurance or are at least silent about it will stay that way if we should get another tearing boom. The constitutional case is not settled, it has hardly begun. But there are reasons for believing that once again Americans are about to treat a serious social and industrial problem realistically. Under the bludgeoning of events more and more of us are persuaded that we shall have to give up comparing a program with perfection. In a debate, the case for perfection always wins. In making a decision on a problem as deep and pervasive and universal as unemployment it is not only silly and naïve to wait for perfection, it is positively dangerous.

This is important even at this stage because our attitude toward unemployment insurance colors our attitude toward its administration and the success of that administration. Unemployment insurance promises no miracles: like any realistic program it has its limits, it has disadvantages to balance against advantages, it has no emotional appeal, it imposes costs financial and other. If there were some better way to do, on the whole, what unemployment insurance can do, we would have none of it. For many of its critics indeed it is not good enough because it does not promise enough. It does have the supreme virtue of a positive program that within rather clearly defined limits will work. It does not fob you off with fine phrases about security on a wider scale or legal phrases about inherent rights or emotional phrases like regimentation. I hope I am not misunderstood when I say that most of the legal, economic and personal argument against unemployment insurance seems to me to be considerably wide of the point. This argument repeats and repeats in a thousand combinations, phrases about the *rights* of Americans, individual, group and corporate. Not duties or obligations, but rights. To the persons who will be the beneficiaries of unemployment and other social insurance this argument about rights must seem strange and even ironically amusing. Unemployment insurance is a collective device to meet at least in part a grave social and industrial evil. We Americans must be prepared to accept the collective part of the idea as well as the device part. It imposes duties as well as rights. There will be costs, perhaps not entirely new costs but at least costs newly recognized or shifted to new shoulders. Particularly on the administrative side I should like today to analyze these costs and duties and the countervailing advantages that we may reasonably expect in return.

It is not necessary here to emphasize the magnitude or the importance of the administrative systems we are setting up for unemployment insurance. In the size of the funds to be collected and invested, in the number of personnel to be hired, fired and directed, in the pervasive and far-reaching effects of the payment of benefits, unemployment insurance administration has no American parallel. To have only an even chance of success the new insurance system needs the very finest administrative direction. What are the chances?

Three factors at least will determine the form of the

administrative machine, and to a very considerable degree the form of the machine, particularly at the start, will influence its effectiveness. First is the unemployment insurance law itself and it is a truism that the best time to amend a law is when you first pass it. Passing a defective law on the hope that soon you will have a chance to amend it has always seemed to me to be wishful thinking. The first mold so often fixes the shape of things for decades to come. Purely as a matter of strategy it is not wise for hostile or conservative interests to take on a negative attitude during the all-important days when a new law is being nursed through informal and legislative committees. The British medical profession learned that lesson when they refused co-operation in preparation of the British health insurance law and have heartily repented since. This point is not academic: three-quarters of the states have still to take action. Once a law is on the books there are provisions that may be eased or even ignored by the wise administrator; the major provisions usually are explicit. One criticism of the New Hampshire administrative regulations is that they are too complicated. In the long view they probably are, but these regulations were devised to carry out the specific requirements of a definite law. The law may have to be—I believe it will be—simplified but that will have to be done by the Legislature and not the administrator. The regulations are as simple as the law permits them to be. May I illustrate?

The purpose of unemployment insurance is to replace, for a limited period, part of wages lost through involuntary unemployment. Wisely or not our early unemployment insurance laws go into considerable detail in prescribing how the amount of these wages shall be determined. The details would be out of place here but the result is that for every insured person out of work in New Hampshire the administrator needs a complete weekly record of employment and unemployment for the preceding six years, including a statement of the causes of lost time.

The proposal from certain quarters to rely for this record on the employer's statement at the time a worker leaves the job becomes on analysis clearly impracticable. Like many another in my hope of administrative simplicity I had thought to carry over into this new field the practice of workmen's compensation administration. I suppose in planning unemployment compensation administration I spent more time trying to get around the requirement of a current detailed employment record than on any other single matter. But I had, like others, reluctantly to give it up. The state dare not depend for the detailed record in this case on a report by an interested party after the event. The report will be colored by the event, the lack of continuous state supervision over employer records will produce inadequate and non-uniform reports, most important of all the state will lose too many employers entirely. Successful employers and large employers—although the experience of the last ten years should suggest otherwise—assume that employers are permanent institutions. But the state dare not assume it, particularly in a state like New Hampshire where they collect part of the contributions from the workers themselves. Even without the contributory feature the state administrator is a trustee of unemployment insurance funds and must act accordingly.

The combined result of a legal fact; a provision of the law and an economic fact; the mortality of employers, is the New Hampshire requirement of current payroll reporting by employers, by individual workmen.

May I cite one more illustration out of many of the primary influence of the law on the form and thus the efficiency of administration? The framers of the New Hampshire law, to win the support both of employers and employes, related the number of weekly benefits to the worker's employment record. The ratio of benefit weeks to employment weeks is one to four for the previous two years, and one to twenty-four for the previous six years. A week of employment in turn is defined as not less than 80 per cent of full-time hours or yielding not less than 80 per cent of full-time wages. But this is not all. The New Hampshire law pays also part-time benefits so that the full-time equivalent of part-time unemployment must be computed. In short in perhaps an impossible attempt at equity the Legislature may have imposed an administrative task that will prove impossible. Only time will tell that; in the meanwhile we have the administrative problem it creates.

Nearly as important among the factors that influence the form of the administrative machinery is the calibre and attitude of the administrative top-personnel. We insult nobody when we repeat the simple fact that in this country we are simply not prepared with man power for the new task. This shortage, this almost non-existence of man power is so acute that the results may well discredit the entire institution for a decade. I sincerely hope not. I hope that as sometimes miraculously happens in workmen's compensation even the political hack will grow up to his job. In the meantime employers must hope and help and give their

strongest moral and material support. It would be fatuous for them to sit back and wait for time and inefficiency to do their worst. They cannot afford a policy of managerial ca'canny. Partly because as we shall see employers are being held jointly responsible for results, partly because you prove nothing by negation and abuse, but mostly because our economic structure simply cannot stand many more wrenches at one of the severest of friction points.

It is heartening to note that as a class the administrators of the new laws are not telling you, they are asking you. No one is an expert in this field: I have suggested that there are important differences between unemployment and our nearest other social insurance, workmen's compensation for industrial accident. If there were no better reason for this administrative attitude, there is the sound reason that the administrator needs employer support more than he needs any other single thing. I know that the administrators in two states among their first acts called in and discussed with employers not only the principles but the details of their joint administrative task. In New Hampshire the need for and alternative possibilities to every requirement were discussed in open meeting and in conference with accountants, auditors, management engineers like yourselves and officers. The result has been that the administrative requirements on the employer will be kept down as much as is humanly possible. He will be permitted to retain his accounting basis and his payroll intervals; he will be permitted to report at intervals best suited to his existing practice; he may be permitted the privilege of submitting copies of his own payroll rather than reports on state forms. The net increase in expenditure of time and money will depend on the quality and extent of the employer's existing payroll records. Even the most complete records are almost never in the precise form that will give all the new facts as a by-product. Many employers including some large ones keep records nearly past belief in these days of cost and other control accounting. On the whole the increased cost will not be as great as many of you fear and certainly not as great as some machine-record companies imply.

I have hopes then that the third factor influencing the form of the administrative machinery, the attitude of the employer, will be positive and not destructive. The employer is not all of public opinion but he is organized and articulate and in proportion to his number is the most powerful of all groups interested in unemployment insurance. In these early days of uncertainty about the legal phases of the laws there is excuse for watchful waiting but even here I believe the better part would be to work and study while you watch and wait, and work and study on something positive and not on new reasons why insurance will not do. As a colleague of mine says, if only the opposition would for once be *for* something. The New Hampshire compromise I think is a beautiful example of how business men can work effectively with the state rather than against it. Rather than harass the administration with injunction suits and organization delays the employers offered to go along with the condition that their and their employes' contributions should be impounded under individual special trust agreements in state depositories. If the law sticks the money will go through regular channels to the unemployment insurance fund. If not it goes back to the contributors with no fuss or delay. It suggests the possibility of other compromises in these pioneer days.

Still other factors that will influence the form of the administrative machinery, for example the industrial and commercial characteristics of the state, will suggest themselves. I pass to the factors that, given the machine, will more immediately affect the machine's efficiency as distinguished from its form.

The first is the baleful influence of politics. The greatest single failure of the federal Social Security Act is its omission of the requirement of state civil service. There may have been excellent reasons, constitutional, partisan and sectional, for the omission, but there it is. Some states like New Hampshire may improvise a merit scheme for selecting personnel but unless the substitute scheme has a firm basis in public support it rests on a foundation too frail to be trusted. The federal Social Security Board may find ways around this handicap, for example by requiring all benefits to be paid through the federally subsidized Wagner-Peyser employment offices, but there is more to administration than paying benefits and the very legality of federal subsidy has been called into question. Even a state as small as New Hampshire will need to recruit a personnel of 200 to 250, many of them in the technical and sub-executive categories. It simply will not do to repeat here our sorry record in workmen's compensation administration. This insurance is too close to where the ordinary man lives, it costs too much to permit its mistakes to escape attention, it affects too many people, it affects too many people at the same time. I have seen both the bright and other face of civil service but on balance I believe

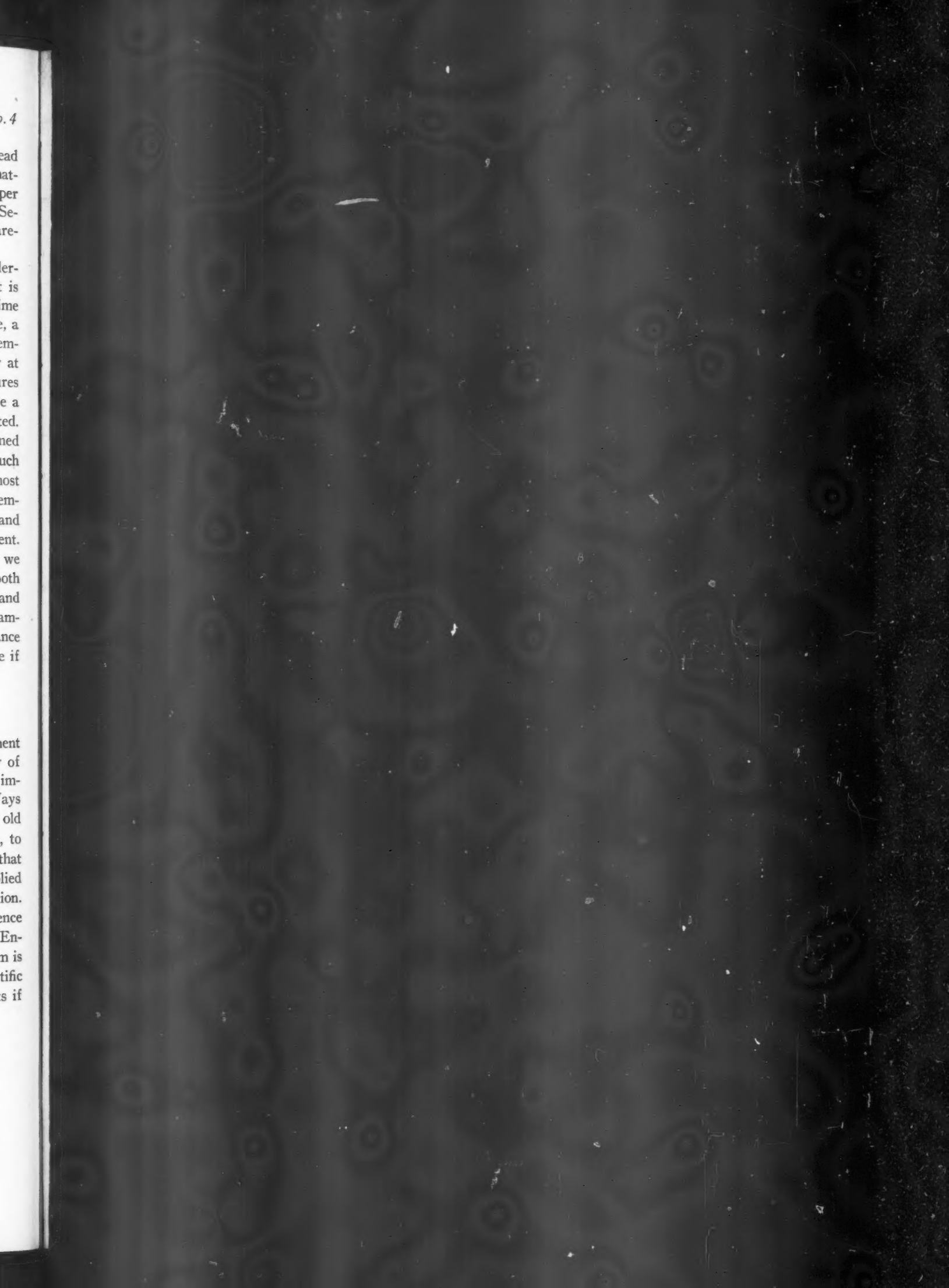
we need its protections in order to make unemployment insurance administration work even reasonably well.

I approach even more delicate ground, the relations between the various agencies of the state interested in employment and unemployment. There exists for example a marked lack of sympathy with this newfangled idea in some employment office quarters. There is in some places a disposition to regard the new organization as an interloper on the time-honored preserve of the older service. The law itself is not always specific on the relationship between insurance and placement and as a result insurance plans are sometimes made without co-operating with placement officers. And even if the law requires that benefits are to be paid through the employment exchanges there is still nearly everything to be done in working out an actual plan for co-operation between the related services. Daily decisions are being made by the insurance official that will affect two years from now the placement official; when the two are not the same person their planning of policy and detail should be a common organization task.

Superimposed on the state agencies will be those of the federal government. It is too early to say exactly what these will be and do although it is quite clear that in unemployment compensation their rôle will be relatively a slight one. Unemployment *is* state insurance. The United States Treasury which will collect the payroll tax is taking the new job in its stride; collecting on an annual basis like the income tax. But the Social Security Board will maintain executive directors and staff experts in each important industrial region and the tact with which these officers work out their relations with state officials and employers will largely determine the success of the federal-state relationship. It is particularly important that the insurance (an independent Board) and placement services (Labor Department) work together intimately and sympathetically on the national level.

He who runs has already read from this discussion the costs of the new administrative system in terms of added function and need for further adaptation of private practice to the common weal. In terms of dollars the administrative bill looms high enough; one-tenth of the unemployment payroll taxes at 3 per cent on a countrywide eligible payroll of twenty-five billions produces an annual administration fund of seventy-five millions. This cost has not been the principal butt of attack; even partisans agree that a 10 per cent overhead is fair by any standard. Some of the states as a matter of fact will have difficulty in spending their 10 per cent and there is already evidence that the Social Security Board is appropriating to the states with a careful eye to getting full value for the money.

And for these costs what do we get? Even considering the administrative bill a net increase—which it is not—there are credits of real value. For the first time in this country we can look forward to a state-wide, a nation-wide concerted attack on the problem of unemployment itself. Indeed one imperative reason for at least federal co-ordination of unemployment measures is that unemployment now is so clearly shown to be a national problem that the point is no longer debated. There is in sight the possibility at least of a planned non-emergency program. We dare not expect too much of this possibility. We must be prepared to spend most of our energy and money in paying benefits. Unemployment will be with us for a long time to come and the immediate task will be to pay rather than prevent. I hope we shall be able to do both: it is essential that we do either or both by plan. Too long we have left both prevention and payment to the occasional employer and trade union. In this country we take pride in our teamwork. Unemployment administration presents a chance to work together on a problem of the whole people if ever there was one.

(Continued from page 105)

find many opportunities for his talents in department store work. The very fact that such a multiplicity of phases is involved requires constant attention to improving methods and getting greater efficiency. Ways will always be found to do new things and to do old things better, but it might not be amiss, in closing, to sound just a word of warning to those who feel that the slide-rule of efficiency can be successfully applied without taking the human factor into full consideration. To those of us who are on the other side of the fence from you, we feel that all too often the Industrial Engineer predicates his facts on the premise that system is all-important and forgets that the most scientific methods possible may not accomplish desired results if the human equation is left out of the picture.